Cost of unserved energy

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Abbreviations

bhp	Brake Horse Power
CUE	Cost of Unserved Energy
CVM	Contingent Valuation Methodology
DFID	Department for International Development
EHT	Extra-High Tension
GDP	Gross Domestic Product
hp	Horse Power
hrs	Hours
HT	High Tension
HVPNL	Haryana Vidyut Prasaran Nigam Limited
kVA	Kilo Volt Ampere
kWh	Kilo Watt Hour
L	Large Farmer
LE	London Economics
LT	Low Tension
M	Marginal Farmer
ME	Medium Farmer
MW	Mega Watt
NIC	National Industrial Classification
NOAA	National Oceanic and Atmospheric Administration
O&M	Operations and Maintenance
ODA	Overseas Development Assistance
Rs	Rupees
S	Small Farmer
SEBs	State Electricity Boards
SM	Semi-Medium Farmer
TERI	Tata Energy Research Institute
WTP	Willingness to Pay

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Executive summary

The power sector in India is characterized by five decades of administered prices, a high level of cross-subsidization, low recovery of revenues, and with certain market segments wielding a strong political influence. In such a scenario, it is difficult to arrive at an 'acceptable' restructuring of tariffs as the market gives limited indications of what can be borne by different segments. Estimates of value of electricity and cost of unserved energy (CUE) are important for both investment planning and for tariff setting. For purposes of tariff setting average CUE values within consumer groups are required.

The research and analysis undertaken in this study for two Indian states – Haryana and Karnataka - provide estimates of average cost of unserved energy (CUE) for the industrial (only manufacturing) and agricultural consumers. The results from this study help in providing guidance on consumer perceptions and their willingness to pay different or higher tariffs.

The study has used following three methods to estimate CUE:

- value of production loss for each unit of power outage (production loss method)
- cost of alternative or back-up power generation (captive generation method)
- willingness to pay (WTP) for reliable and uninterrupted electricity supply (WTP method).

About 500 manufacturing industries and 900 farmers in each state were randomly surveyed using pre-tested schedules to collect primary data for the calculation of CUE in the two sectors by consumer category. Major findings of the study are set out below.

Industry

The three analytical methods have given different estimates of CUE in manufacturing industries in the two states (Table 1). These estimates are based on primary data collected from 553 manufacturing industries in Haryana and 501 in Karnataka. In Haryana, the estimates of CUE are Rs 5.26/kWh (production loss method), Rs 3.71/kWh (captive generation method), and Rs

5.11/kWh (WTP method). The corresponding estimates for Karnataka are Rs 22.09/kWh, Rs 2.63/kWh, and Rs 4.89/kWh.

Table1 Estimates of CUE for industry at 1999 prices (Rs/kWh)

Method	LT	HT	ALL
Haryana			
Production Loss	6.19	5.24	5.26
Captive	4.05	3.70	3.71
WTP (consumers' willing to pay more)	4.98	5.11	5.11
	(40)[a]	(46)	(43)
Tariff (actual)	3.60	3.60	3.60
Karnataka			
Production Loss	15.45	22.39	22.09
Captive	4.05	2.61	2.63
WTP (consumers willing to pay more)	4.73	4.90	4.89
	(57)	(43)	(51)
Tariff (estimated)	3.46	4.33	4.31

[a] Figures within parentheses indicate percentage of only those industries that were willing to pay more than what they currently pay for the grid supply.

While analysing the data collected from sample industries in the two states the following observations were made.

- The mean value of sales volume in an industrial unit in Karnataka is almost double of that in Haryana. The average volume of sales in an HT (High Tension) industry in Karnataka is about Rs 440 million, compared to Rs 221 million in Haryana. Similarly, in an LT (Low Tension) industry the average sales value is Rs 10 million in Karnataka, compared to Rs 5 million in Haryana.
- Average duration of power cut in the HT industry in Haryana is nearly three times that in Karnataka. In the LT industry in Haryana, the duration is one and a halftimes that in Karnataka.
- The major cause of production losses in industries in both the states is unscheduled power outage.
- The bulk industrial consumers of electricity in the two states have invested heavily in captive power generators as a coping strategy to avoid production losses due to outages.
- Industries in Haryana are more dependent on captive power, which accounts for 62.5 percent of the power consumed by industries in the state. The corresponding figure for Karnataka is only 53.9 percent.

The above factors explain some of the variation in the results in the two states for the same method used.

A significant result from the study is that in both states, taking all industries together, the CUE values using the WTP method (consumers who are willing to pay more than what they currently pay for electricity) are higher in both the states than those based on the cost of captive (alternative) generation. However, they are lower than the estimates derived using the value of production loss per unit of outage method. This result is in accordance with our expectations as the production loss method may overestimate the CUE, since it may be possible to avoid or reduce some of the costs by rescheduling production etc. In contrast the cost of captive generation estimate is likely to underestimate the CUE, since it simply shows that industrial and agricultural enterprises are willing to spend, or are already spending, at least this amount (though they may be willing to pay substantially more.

The additional marginal value derived using the WTP method is about 38 percent higher in Haryana and 86 percent higher in Karnataka higher than the corresponding costs of alternative generation.

The values of CUE derived using both the WTP and captive generation methods are higher in Haryana than those in Karnataka (4.5 percent higher for the WTP method and 41 percent higher for captive generation method). The difference in estimated CUE in the two states is partly due to differences in the type, size, structure, and composition of industries in the two states.[a] It is also due to differences in the duration of power outages, with outages in Haryana being longer than those in Karnataka. In LT industries, the estimated values of CUE derived using both methods are almost the same in the two states. However, the values are different for HT industries (Table 1).

The key factors that appear to be driving the results from each method are discussed below.

[a] **The composition of industries is very different in the two states. The data sets compiled for industries in the two states based on the data collected from over 500-industry show that the structure, composition, size, and type of industrial products within a particular two-digit NIC code are very different.**

Production loss method

Compared to the other two methods discussed above, this method is relatively weak. Using this method, with its reliance on recall, it is very difficult to obtain accurate estimates of the net production loss due to power outages (or the lost value added). As mentioned earlier, this method is likely to over estimate the values of the CUE. Table 1 shows the average production loss per unit outage in industries is estimated to be considerably higher in Karnataka (Rs 22.09/kWh) than in Haryana (Rs 5.26/kWh). The likely reasons for this large difference in estimated values are given below.

The productivity of electricity (grid-based) defined, as the value of sales per unit of electricity from grid is much higher in Karnataka than Haryana. This result is unchanged if electricity productivity using total electricity, i.e. grid as well as captive, is considered (Table 2). We can conclude that the higher value of sales per unit of electricity consumed in Karnataka compared to Haryana implies higher loss due to a power cut.

Table: 2 Average productivity of electricity in the industrial sector

	Haryana			Karnataka		
Item	HT	LT	Average	HT	LT	Average
Total value of sales (million Rs/year)	221.57	5.34	121.32	444.35	10.06	189.33
Grid electricity consumption (million kWh/year)	0.93	0.03	0.51	2.04	0.03	0.86
Captive electricity consumption (million kWh/year)	1.53	0.03	0.83	2.46	0.02	1.02
Total electricity consumed (million kWh/year)	2.45	0.05	1.34	4.44	0.05	1.86
Productivity per unit of grid electricity (Rs/kWh)	330	299	316	1055	691	840
Productivity per unit of total electricity (Rs/kWh)	179	139	160	522	415	459

Currently, on average HT industries in Haryana face 6.6 hours of power cuts and LT industries face 3.6 hours of power cuts each day from the grid supply. In Karnataka, power cuts in grid supply are 2.4 hours and 2.3 hours for the HT and LT industry respectively. For the most part, the type of power failure is unscheduled outages and demand cuts, with very little scheduled cuts. Given the very poor grid supply situation in Haryana for several years, industries have adapted by investing heavily in alternative sources of power

generation, in addition to rescheduling their production processes. In Karnataka, the shortage in power supply to industries is not as severe as in Haryana. Haryana's greater reliance on captive generators has led to a lower estimate for CUE by the production loss method.

The combination of the foregoing factors indicates that the estimated average cost of (gross) production loss per unit of electricity not available from the grid in Karnataka for HT industries is over 4 times that for HT industries in Haryana. Similarly, for LT industries, the estimated value in Karnataka is 2.5 times that in Haryana (see Table 1).

Captive generation method

The average cost of captive generation depends on two factors: (1) total cost of installing and running a generator, say in a year, and (2) units of electricity generated annually. Clearly, the higher the utilization factor of a generator, the lower is the cost of generating each kWh. In Karnataka, the average capacity utilization factor of all captive units in all types of industries taken together is higher (29.7 percent) than in Haryana (25.4 percent). As a result, in Karnataka, the average cost of generating electricity by captive units is calculated at Rs 2.63/kWh, compared to Rs 3.71/kWh in Haryana (Table 1). The likely reasons for the difference in estimated values are given below.

- Capacity utilization is higher in Karnataka in the HT industry resulting in lower costs for captive generation in Karnataka (Tables 3 and 1).
- Two industries account for half of the captive generation in the sample and their cost of captive generation is very low compared to the other sample. They are therefore suppressing overall average cost of captive power generation in Karnataka.

Table 3 Dependence on captive generation in Haryana and Karnataka

Captive generation	Haryana			Karnataka		
	LT	HT	Average	LT	HT	Average
Percentage with captive back-up (%)	73	97		56	92	
Average utilisation factor (%)	13.2	33.6	25.4	11.2	93.2	29.7

There is only a small variation in the average utilization factors of generators used by LT industries (13.2 percent in Haryana and 11.2 percent in Karnataka). As a result, the average cost of captive generation for LT industries in both states is estimated to be Rs 4.05/kWh.

WTP method

Of all industries surveyed, a certain percentage did not believe the scenario of improved power supply from the grid i.e., the respondents rejected the scenario of improved power supply. Of those who accepted the scenario, only a fraction was willing to pay more than what they currently pay. Figure 1 illustrates these numbers for Haryana and Figure 2 for Karnataka. The CUE for industrial consumers in Rs 5.11/kWh in Haryana and Rs 4.89/ kWh in Karnataka.

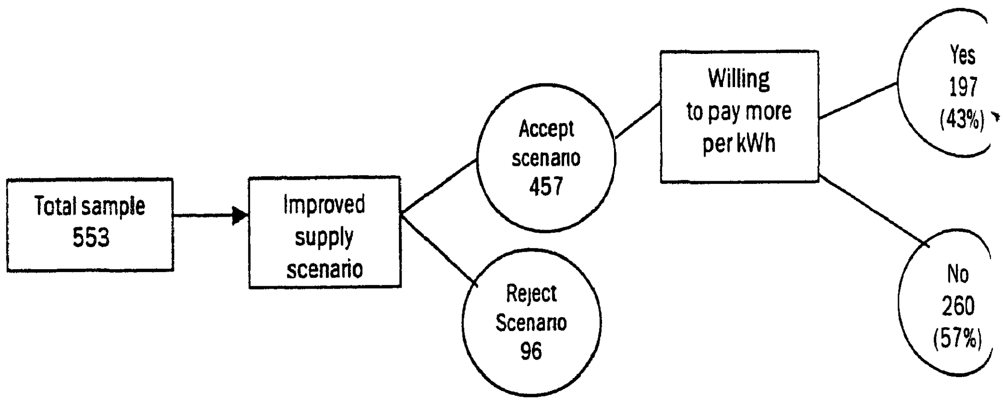


Figure 1 Response by industries in Haryana

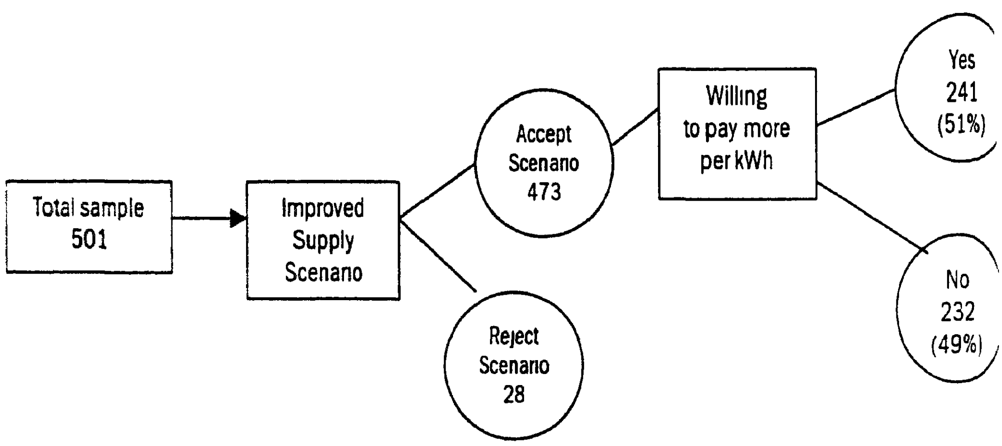


Figure 2 Response by industries in Karnataka

The HT and LT industries in both states are willing to pay more than what they currently pay for improved supplies (Table 1). Interestingly, in Haryana a larger percentage of HT consumers are likely to pay more for improved power supply than LT consumers (46 percent versus 40 percent). However, the results are reversed in Karnataka, where 57 percent of the industries in the LT category are willing to pay more for improved power supply, but only 43 percent of those in the HT category.

Almost half of the sample industries in Karnataka and a little over 60 percent of those in Haryana were not willing to pay more than the current cost of electricity for improved power supply. The key reasons given for this were: (a) the current cost is unaffordably high; (b) belief that the industrial tariff is already above the cost of supply; (c) belief that supply is cheaper in other states; and (d) reliance on self generation.

The factors that determine whether an industrial consumer is willing to pay more for improved supply and, if so, how much were also analyzed. The first aspect of the WTP bid (whether to pay for improved supply) is investigated by Probit regression, while the second aspect (the level of the WTP bid) is investigated using ordinary least squares regression techniques.

The Probit regression results identified a number of variables in Haryana that have a significant effect on the decision to bid for improved electricity supply. These are as follows.

- The share of electricity in the total cost is small.
- Consumers pay a relatively low price for each unit of electricity purchased.
- Unscheduled outages are a serious problem.
- Unofficial payments to state electricity board staff for restoration of power are a serious problem.
- Consumers believe that tariffs are low compared with other states.
- At least some back-up generation is available.
- The type of industry and its sensitivity to continuous electricity supply.

Variables that do not have a significant effect on the decision to bid for improved electricity supply in Haryana include.

- The duration of supplies interruptions.
- The size of thc contracted demand or scheduled load in HT or LT industry.
- Problems of voltage fluctuation.

The results of the Probit regression in Karnataka are very similar to those in Haryana. In Karnataka, the following variables have a significant effect on the decision to bid for improved power supply.

- The share of electricity in total cost is relatively small.
- Consumers have at least some captive generation facility.
- Consumers do not rely largely on self-generation for their electricity supply.
- Consumers experience high levels of unscheduled outages.
- Identified scheduled outages or demand cuts are a serious problem.
- Consumers do not believe tariffs are already too high.

As in Haryana, the following variables do not have a significant effect on the decision to bid for improved electricity supply.

- The duration of most types of supply interruptions (excluding unscheduled outages and possibly demand cuts in summer).
- The size of the contracted demand or scheduled load in HT or LT industry.
- Problems of voltage fluctuation.

Agriculture

Before considering the estimates of CUE in the agriculture sector, it is important to note that there is a wide variation in the average depth of the water table and in the cropping pattern in the two states. Further, there is also a significant difference in the nature of the power supply problem. The average depth of water table is about 17 metres in Haryana, and the major crops produced are food grains (cereals and pulses). In Karnataka, the average depth is about 50 metres, and the major crops produced are such cash crops as cotton, sunflower, cardamom, and arecanut. Given the large difference in the depth of the water table, most of the farmers in Karnataka (about 58 percent) choose an open well or rely on the canal system using surface water for irrigation, while the majority of farmers (78 percent) use groundwater (borewells) in Haryana.

Considering the power supply problems, the farmers in Haryana rated voltage fluctuations as the most serious problem whereas for those in Karnataka, it was unscheduled outages.

The cost of electricity, or the imputed tariff rate for agricultural consumers, is lower in Karnataka. The majority of the farmers in the two states who own electric pump-sets pay for electricity using a flat rate depending upon the installed capacity of the pump-set (although for a small percentage of farmers the supply is metered). For instance, in Haryana, the flat rates fall in the range Rs 360/ bhp of the electric pump-set per year (for groundwater table depth

above 60 metres) to Rs 780/bhp/annum (for depth up to 30 metres). However, in Karnataka, it costs Rs 300 per bhp per year to a farmer irrespective of the depth of the water table. To convert these rates to costs expressed in Rs/kWh, one needs to know the average installed capacity of electric pump-sets in the two states and their utilization pattern. The average installed capacity of an electric pump-set is 6.1 kW in Haryana and 5.2 kW in Karnataka. On average, a farmer in Haryana gets about 750 hours of electricity in a year during the three cropping seasons (rabi, kharif, and summer). The corresponding figure for Karnataka is 1320 hours. Given the average capacity and utilization pattern of the electric pump-sets in the two states, the imputed electricity tariff for all sample farmers together in both the states is calculated to be Rs 1.32/ kWh in Haryana and Rs 0.27/kWh in Karnataka - a difference of almost five times (Table 4). On analysing these data across farmers with different sizes of land-holding, we find that the unit electricity cost in Karnataka works out to be 1/3 rd to 1/7 th of what it costs a farmer in Haryana. The difference is the largest for large farmers and the smallest for medium farmers.

The three methods have given different estimates of CUE across different category of farmers, based on size of their land holding in agriculture in the two states (Table 4). These estimates are based on primary data collected from 908 farmers in Haryana and 910 farmers in Karnataka.

Table 4 Estimates of CUE for irrigation at 1999 prices (Rs/kWh)

	Marginal (< 1 ha)	Small (1 - 2 ha)	Semi-medium (2 - 4 ha)	Medium (4 - 10 ha)	Large (> 10 ha)	Average
Haryana						
Net production loss	1.06	1.92	1.40	0.84	1.70	1.34
Cost of alternative generation (diesel pump-set)	3.83 (4.8)[a]	3.79 (5.9)	4.12 (7.5)	3.78 (9.6)	3.31 (10.5)	3.84 (7.2)
Cost of electric pump-set	3.92 (4.5)	3.84 (6.3)	2.76 (7.9)	1.94 (11.4)	2.30 (12.2)	2.92 (7.6)
Imputed electricity tariff	1.59	1 50	1.11	0.92	1.81	1.32
WTP[b]						
Karnataka						
Net production loss	3.89	4.29	3.10	2.47	2.03	3.21
Cost of alternative generation (diesel pump-set)	15.82 (1.3)	11.59 (3.5)	7.37 (4.2)	14.10 (1.3)	na	9.56 (3.0)
Cost of electric pump-set	2.14 (8.2)	2.31 (9.1)	1.90 (11.3)	1.93 (11.5)	1.61 (13.8)	1.99 (10.4)
Imputed electricity tariff	0.29	0.30	0.25	0.25	0.26	0.27

[a] Figures in parentheses indicate the average capacity utilization factor (in %) of pump-sets

[b] WTP results in agriculture sector are statistically insignificant for the two states and are therefore not reported

Production loss method

The value of production loss estimated in agriculture is the net value lost. This is based on the farmers' perceptions of reduction in profits due to non-availability of electricity. The estimated value is Rs 1.34/kWh for Haryana and Rs 3.21/kWh in Karnataka. The large difference is due to the varying cropping pattern in the two states, with Karnataka mainly producing cash crops and Haryana producing food grains. The estimated value of CUE is significantly higher than the imputed electricity tariff in Karnataka, while the difference is marginal in Haryana. The main reasons for this are that.

- imputed tariffs are much lower in Karnataka compared with Haryana.
- Karnataka grows cash crops with a high value-added component.

Captive generation method

Of the 900–odd farmers surveyed in each of the two states, we found that in Haryana, 393 had electric pump-sets and 391 had diesel pump-sets (91 had both electric and diesel pump-sets). In Karnataka farmers predominantly depend on electric pump-sets, 758 had electric pump-sets and 59 had diesel pump-sets (16 had both electric and diesel pump-sets). Thus in the case of power outages during critical periods of irrigation needs, farmers in Haryana can use their diesel sets to save their crops. This is not the case in Karnataka, where very few diesel pump-sets are used, primarily due to the non-suitability of diesel pumps for the deeper water table in Karnataka and partly due to lower electricity tariffs making diesel pump-sets a relatively more expensive option.

The current costs of running electric pump-sets in Karnataka decrease from marginal to large farmers, while in Haryana the downward trend is observed from marginal to medium farmers (Table 4). In Haryana, the average cost of running an electric pump-set is higher for large farmers. This is partly because the large farmers in Haryana typically own more than one pump-set (each with lower intensity of capacity utilization) and also because of their preference to install branded pump-sets, which cost more than unbranded sets. For small and marginal farmers, the costs of supply using electric pump-sets exceed those for farmers in semi-medium and medium categories due to their lower level of utilization of the electric pump-sets.

Despite the capital cost of a diesel pump-set of 1 kW capacity being about half of that of an electric set, the cost of running a diesel pump-set (captive method) works out on an average to be higher than the cost of running an electric pump-set, primarily due to high price of diesel. The corresponding

average values of CUE are estimated to be Rs 3.84/kWh and Rs 2.92/kWh in Haryana, and Rs 9.56/kWh and Rs 1.99/kWh in Karnataka, respectively.

Clearly, the higher the utilization factor of a pump-set, the lower the average cost of running it. For instance, in Karnataka, the average cost of running a diesel pump is estimated to be Rs 15.8/kWh for marginal farmers with a very low utilization factor of 1.3 percent. But, with a higher utilization factor of about 4.2 percent in the semi-medium category, the average cost works out to be Rs 7.37 per kWh. The corresponding estimates for Haryana are relatively lower due to the higher level of utilization of pump-sets.

WTP method

The percentage of farmers in Haryana who are in principle willing to pay more on a bhp basis is less than that in Karnataka (15 percent in Haryana compared to 58 percent in Karnataka). This is due to a much higher tariff (double) in Haryana (Rs 780/bhp/year in Haryana compared to Rs 300/bhp/year in Karnataka). Considering the farmers' requirements for extra hours of electricity supply, we found that only 2 percent of the farmers in Haryana (less than 20) and only around 3 percent (only 23 farmers) of the farmers surveyed in Karnataka were willing to pay more per kWh than what they currently pay for improved electricity supply. Figure 3 illustrates these numbers for Haryana and Figure 4 for Karnataka. The sample size is too small in both the states to produce a meaningful estimate of CUE. For the same reason, regression analysis could not be carried out to analyze the factors influencing willing to pay bid.

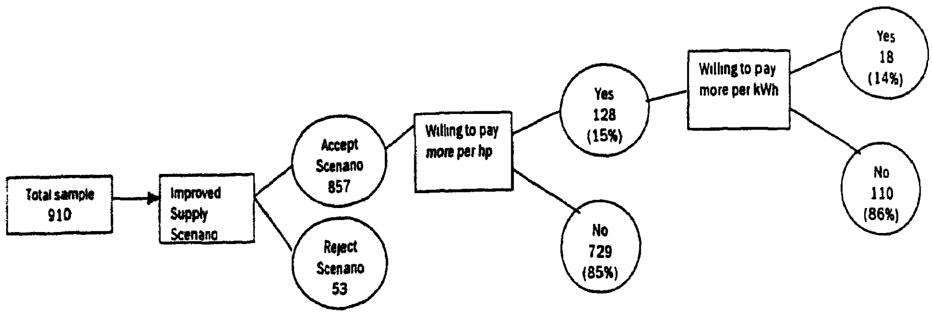


Figure 5 3 WTP more per kWh response in Haryana for irrigation

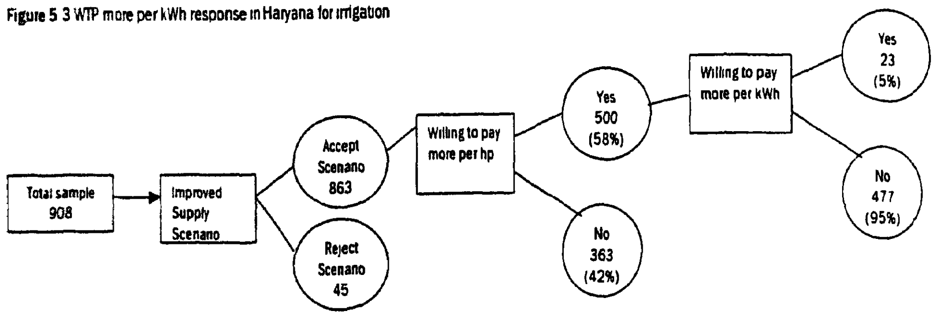


Figure 5 4 WTP more per kWh response in Kamataka for irrigation

There were several constraints in the agricultural sector. The cost of captive (alternative) supply option is a valid methodology for Haryana but not for Karnataka as few farmers can select an alternative to electric pump-sets. In the agriculture sector, the willingness to pay method has not worked well. Only a very small percentage of respondents agreed to pay more than what they currently pay, which is very different from the results in industrial consumers. Given this, we believe that the cost of alternative supplies, namely the cost of pumping using diesel pump-sets in Rs/kWh equivalent, provides the best estimates CUE in the agriculture sector in Haryana. While the cost of pumping using diesel pump-sets works fine in Haryana, it cannot be used in Karnataka as a very small percentage of the sample use diesel pump-sets and no statistically significant results can be derived from this sample. As a result, the value of CUE in Karnataka is best estimated using the value of net production lost method. In Haryana, the values of CUE derived using this method are close to current imputed tariffs. This suggests that there is little scope to increase tariffs for agricultural consumers in Haryana.

The following conclusions could be drawn, which are important for policy-makers.

- Compared to large farmers, marginal and small farmers typically pay more per unit for the electricity they get from the grid. There is a need for appropriate policy to address this tariff distortion.

- The majority of farmers are willing to spend more on electricity on a bhp basis if they receive an improved supply of electricity. Farmers were willing to spend up to 50 percent more for improved supply compared to what they pay now on a bhp basis.
- The extra hours of electricity demanded (unmet demand) for irrigation exceeds 50 percent. As a result, for most of the farmers who had indicated a willingness to pay more on a bhp basis the bid is lower than the current tariff they are paying when translated into a per kWh basis.
- The imputed tariff estimated from the survey data, which provides an understanding of what farmers currently pay on a kWh basis, indicates their ability to pay rather than their willingness to pay.

Policy implications

The research and analysis undertaken in this study provides useful insights that can provide inputs in designing effective policies for the power sector.

1. The electricity markets in the two states are complex and there is no single approach that can be used to arrive at electricity tariffs that different segments of the market will accept.
2. The use of the contingent valuation method (WTP) can be used to estimate the CUE for the industrial sector. The study has shown that a significant proportion of industrial consumers in both Haryana and Karnataka are not only willing to pay more for improved power supply, but also that they would prefer this to be delivered by the private sector. The industrial sector in Haryana is willing to pay over 40 percent more than current tariffs; for Karnataka, the figure is 13.5 percent.
3. The study has identified (or reconfirmed) the factors that must be addressed if consumers are to be persuaded to pay higher tariffs. These include factors related to the organization of the power sector (for example the need to address the issue of 'unofficial' payments made to utility's staff) and factors related to the quality of electricity supply. The key here is to give consumers good information so that they can plan accordingly. Thus the study found an urgent need to address unscheduled outages, followed by scheduled outages and voltage fluctuations.
4. Generalizations for a customer group should not be made for India as a whole. For example, in Karnataka a clear majority of farmers are willing to spend more each year if they receive an improved supply (this needs to be tested against tariffs set at cost-recovery levels). They are willing to spend up to 50 percent more for improved supply if charged, as now, in per hp

terms. However, in Haryana, only around 15 percent of farmers are willing to pay for such improved supply on a hp basis. The main reason for this could be that the tariff in Haryana is nearly double of that in Karnataka.

5. The WTP method does not provide useful results in the agricultural sector. In both the states the farmers are willing to pay more in hp terms. This combined with the demand for increased usage, does not indicate a willingness to pay more in terms of rupees per kWh. Charging agricultural users on the basis of hp does not provide the right incentives for rational consumption of power. In a reformed power system, consideration should be given to switching to metered consumption. This will reflect the correct and the actual price paid by the consumers' (e.g., calculated imputed tariffs are quite substantial in Haryana), induce a rational consumption behaviour and also assist in improving the supply of power. Thus there is an immediate need to change the mindset of consumers with respect to electricity tariffs.
6. An important policy indicator that emerges from this study is that it is necessary to focus on both the demand and the supply side. On the demand side, especially, for the agricultural consumers, a change in the mindset and perception of consumers is required in terms of not treating electricity as a subsidized resource. Farmers in Haryana are obviously paying a significantly higher (implicit) tariff than is widely perceived. And, paradoxically, it is the small and marginal farmers who are paying a higher (implicit) tariff for poorer service. These facts should be brought to the attention of both the politicians and the farmers in the state, which could provide the platform for introducing a metered tariff system. In Karnataka, while the implicit tariff is very low, other limitations on the choice of technology need to be recognized. Strategically, the point needs to be made that for every unit the utility is unable to supply, the farmers are losing about 2 to 4.3 rupees in profits.

1 Introduction

1.1 Background

India's power sector has been characterized by large and frequent interruptions to electricity supply, arising from shortages of both capacity and energy. These shortages have been driven by both supply and demand factors. A key factor on the supply side has been the shortage of investment funds and the inability of the central and state governments to meet investment requirements from public budgets. Shortages have also been driven by the relatively poor utilization of much of the existing capacity. On the demand side, inadequate tariffs and failure to control non-technical losses, particularly theft, have exacerbated the situation.

Many state governments have formulated reform programmes to address both the foregoing supply and demand factors. State electricity boards are being reformed following the lead taken by Orissa. These reform programmes are aimed at attracting private sector finance, particularly for generation and distribution, and changing incentive systems. Regarding the latter, a key part of the reforms is to ensure that tariff levels are set to ensure financial viability of new power sector entities and that consumer pay for the electricity supplied to them.

The reform models being introduced in Orissa, Haryana, and elsewhere is based on the so-called single buyer model. In the longer term, some of these states may introduce more far-reaching reforms, including the introduction of competitive power pools. Irrespective of the reform model which is adopted, and whether reforms are based on a variant of the single buyer model or a competitive power pool, it will be important to have reliable estimates of the value of unserved energy or lost load. In the states that already have, or will introduce the single buyer model and in the states that are yet to introduce any reforms, the cost of unserved energy (CUE) or the value of lost load will be of crucial importance in determining the need for new generation capacity. It will also be important when planning for the development of transmission and distribution systems. When competitive pools are introduced, CUE will be a key determinant in the capacity payments made to generators during periods when

the security of supply standards is infringed. In all cases, too high a value could lead to excessive investment in the power sector, and vice versa.

The energy situation in the country being far from ideal, it is vital to focus attention on the significance of unserved energy. Good estimates of the CUE are also important for the design and implementation of tariffs, particularly where electricity supply businesses use interruptible supply tariffs, and for setting time-of-use tariffs.

Given this background, the Tata Energy Research Institute (TERI) and London Economics (LE) were appointed by the World Bank and the UK Department for International Development (DID), respectively, to undertake an empirical study to estimate the CUE in India by focusing on two states, namely Haryana and Karnataka.

2 Scope and methodology

The principal objective of this study is to estimate the cost of unserved energy (CUE) in the agricultural and industrial sectors in two representative Indian states, namely Haryana and Karnataka. Considering the multiple ways, unserved energy can affect productivity, it is hard to decide a method to estimate CUE. The aim of the study is therefore to provide a more reliable interval estimate of CUE.

There is no such thing as a definable CUE — it varies from case to case, depending on any or all of the following factors

- The customer who suffers because of power outage or fluctuations in voltage and frequency.
- Whether and to what extent the customer is forewarned about such interruptions of supply.
- The time of the day and the season during which the supply fails or fluctuates.

Several methods can be used to estimate the CUE. For this study, the following three methods were used:

- cost of production loss for each unit of power outage
- cost of alternative or back-up power generation
- willingness to pay for reliable and uninterrupted power supply.

Since the study does not cover all consumer classes in the two states, it cannot estimate the total weighted average CUE and will need to be supplemented by data procured from the remaining consumer classes. The importance and potential value of the study lie in three main areas, as follows.

- It is the first extensive use of Contingent Valuation Method (CVM) in power sector, in India or elsewhere in the world;
- the use of three different methods to measure CUE provides a useful assessment of the reliability of the CVM in the power sector; and

- perhaps most important, the results of the study provide potentially valuable information for the on-going process of reforming the power sector in many states and for the reform of tariffs.

The main steps followed in implementing the proposed methodology for the two sectors, namely agriculture and industry is as follows:

1. Designing of the agriculture and industrial schedule
2. Pre-testing of the schedules in each state
3. Undertaking of a pilot survey in each state
4. Modifying the schedules based on the pilot studies
5. Sample selection
6. Secondary and primary data collection
7. Data compilation, processing and analysis
8. Interpretation of results
9. Presentation of results

This chapter is divided into three sections. Section 2.1 deals with the methods of estimation, section 2.2 describes the sampling design and section 2.3 deals with the method of data collection and analysis.

2.1 Estimation of the cost of unserved energy

2.1.1 Direct assessment (Method 1)

The direct assessment approach uses questionnaires to ascertain the cost of an interruption of supply or a reduction in its quality as perceived by industrial and agricultural consumers. The approach provides a useful first indication of the possible costs of power outages.

While adopting this approach, it is vital to keep in mind that there are a number of well-known limitations inherent to the approach. In particular the fact that industrial enterprises routinely suffering from power cuts are sure to minimize the losses due to power cuts either by rescheduling production or resorting to captive power units. Agricultural users, too, can often reschedule the use of pump-sets to offset losses incurred due to power outages. This means that great care must be taken when using this approach to estimate CUE, since it can be easily overstated.

In the industrial sector, the estimated cost of power outages is based on the reported value of production loss attributable to disrupted power supply. Such is

not the case in agriculture sector, where the farmers have provided notional values for the increased yield due to additional irrigation opportunities if extra hours of electricity were available from the grid. In the agriculture sector, therefore, the production loss attributable to power outages is used in estimating the CUE. More specifically, the estimation method used in agriculture is based on the incremental crop output not realised (opportunity lost) due to non-availability of power for irrigation. This means that the approaches used to estimate the CUE in agriculture and industry are different.

The production loss method is defined as the loss in production due to the unavailability of electricity supply from the grid. The production loss per unit of power outage by the i^{th} consumer denoted by *Li* within a particular category (i.e., industry or agriculture) is estimated by using the following formula (1).

$$Li = \frac{\left(\frac{value\ of\ production\ loss}{hours\ of\ outage}\right)_i}{\left(\frac{electricity\ consumed\ from\ grid}{hours\ of\ electricity\ available\ from\ grid}\right)_i} \quad \text{... (1)}$$

However, by taking the simple average of *Li*'s across consumers within a particular category, one cannot capture correctly the production loss per unit outage for the category. This is due to the large variations in power consumption and size of the consumers. To correct this, it is necessary to assign a weight parameter to *Li* and compute the weighted average. In view of this, electricity consumption from the grid by the i^{th} consumer was considered to be the weight corresponding to *Li*. The weighted average of *Li* would then provide the average cost of production loss per unit of electricity not available and is denoted by *L*. The estimated value of *L* expressed mathematically in equations (2) and (3) provides the CUE within a consumer category. This method is referred to as the direct assessment method, or Method 1.

$$L = \frac{\sum_i Li \times Ui}{\sum_i Ui} \quad \text{... (2)}$$

$$Li = \frac{\frac{Pi}{Oi}}{\frac{Ui}{Ai}} \qquad ...(3)$$

Where,

L = weighted cost of production loss per unit of power outage from the grid, expressed in Rs/kWh

P = annual production opportunity loss, expressed in Rs

A = annual hours of electricity available from grid

O = annual hours of electricity not available from grid

U = annual electricity consumption from the grid, expressed in kWh

i = number of valid cases

2.1.2 *Indirect assessment (Method 2)*

Frequent interruptions of power supply in many parts of the country have resulted in the widespread use of stand-by equipment and/or the scheduling of production to minimise the impact of anticipated outages. Consequently, it was argued that the main outage costs are reflected in the use of stand-by energy. The indirect assessment method for estimating the CUE uses data on the costs that customers incur to ensure a reliable power supply. These include the costs of investing in auto-generators or captive power units and diesel pumps. The indirect assessment method has been widely used and can provide useful information on the implicit value of a unit of electricity.

This method has been previously used by TERI, New Delhi, jointly with ElectroWatt Engineering Ltd, Zurich, in 1997 / 98 for studying the cost of captive power generation using alternative energy sources (mainly diesel oil) in industries and the cost of running diesel pump-sets for irrigation in the state of Gujarat[1]. The method was also used by London Economics and the Power Finance Corporation for the study of outage costs in Cuttack, Orissa, which was

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[1] ElectroWatt Engineering Limited and TERI, 1998. Development of a Framework for Electricity Tariffs in Gujarat. T.A. No. 2739-IND. Submitted to the Asian Development Bank and Gujarat Electricity Board in September. Study jointly conducted by the ElectroWatt Engineering Limited, Zurich and TERI, New Delhi.

supported by the UK ODA.

The main drawbacks of the indirect cost estimate method are as follows.

- For customers who do not install back-up power, the only information provided is that the value they place on reliable power supplies, is less than the cost of the back-up supplies. Their WTP (willingness to pay) may still exceed existing tariff rates, but the methodology would not reveal this
- For customers who do install back-up supplies, the methodology only tells us that their WTP is at least equal to the cost of back-up power, though it may well exceed that level. The methodology would give little, if any, information about the actual WTP and how high it is likely to go.

Hence, the value of the CUE derived from this methodology is at best a lower estimate.

The economic cost of captive power generation or diesel pumping for the i^{th} consumer using j^{th} back-up unit denoted by Cij is given by the following formula (4).

$$Cij = \frac{(annualized\ capital\ cost + annual\ maintenance\ cost + annual\ fuel\ cost)_{ij}}{(total\ units\ of\ electricity\ generated\ in\ a\ year)_{ij}} \quad \ldots (4)$$

Further, the average economic cost of captive power generation or diesel pumping for the i^{th} consumer denoted by Ci would be given by the weighted average of the economic cost of electricity generated by each captive unit or equivalent electricity generated by the diesel pump-set of the i^{th} consumer. The weights assigned are - the amount of electricity generated by each captive unit or the equivalent of electrical energy produced to run each pump-set. Mathematically, the following equation (5) is used to estimate Ci.

$$Ci = \left(\frac{\sum_j Cij \times Uij}{\sum_j Uij} \right) \quad \ldots (5)$$

Finally, the average economic cost of back-up power generation across all consumers within a particular category is weighted by the electricity generated by the captive units or equivalent electricity generated by diesel pumps. Such a weighted average denoted by *C* provides the CUE within a consumer category using an indirect assessment method, referred to as Method 2. Mathematically, this is expressed in equations (6) to (8).

$$C = \frac{\sum_{i} Ci \times Ui}{\sum_{ij} Uij} \qquad ...(6)$$

$$Cij = \frac{Kij \times R_i + Mij + Fij}{Uij} \qquad ...(7)$$

$$R_i = \frac{r}{1-(1+r)^{-n_i}} \qquad ...(8)$$

Where,

C = annualized cost of back-up power or diesel pumping, expressed in Rs/kWh
K = capital cost of the back-up device at current prices, expressed in Rs
U = electrical units generated by the back-up units, expressed in kWh
R = capital recovery factor
M = annual operating and maintenance cost, expressed in Rs
F = annual fuel cost of back-up generation, expressed in Rs
r = annual rate of interest (assumed to be 10 percent)
n = total life of the back-up device, expressed in years
j = number of back-up units
i = number of valid cases

2.1.3 Willingness to pay survey (Method 3)

Consumers who believe that there is a problem with their current electricity supply may be willing to pay more for increased hours, stability, and regularity

of supply. This willingness to pay a particular amount to fix the problems they face is a fair estimate of the CUE for an industrialist or a farmer.

This method, known as CVM (contingent valuation method), of estimating the CUE differs from the two methods discussed earlier. The earlier methods attempt to infer the cost of supply interruptions either from the value of production lost due to these interruptions (Method 1) or from the cost of alternative supply sources (Method 2). It is quite possible for a consumer to incur a real cost because of interrupted supply, even when the cost is not high enough to warrant the purchase of back-up generation. For this group of consumers, the CVM approach allows us to estimate the CUE even when there are no data on the alternative cost of supply. In contrast, an industrialist's recall of the value of production lost due to certain hours of planned and unplanned outages is likely to be an overestimate of the CUE to the extent that some mitigating action can be taken (by rescheduling production or re-using some spoiled products). Again, the CVM approach allows us to capture just how serious supply interruptions are to this industrialist. Any existing investment in back-up generation will tend to reduce the WTP and hence, in India, the results from this method for those with back-up are inevitably conservative.

The marginal value of improved supply produced by the WTP estimates applies only to those who are willing to pay for improvements. In this respect the WTP approach is analogous to the cost of alternative supply, in which we record a CUE estimate only for those with back-up generators. In contrast, the value of lost production is recorded for all producers (whether or not there is any production loss). An average value can be derived by combining the WTP for improved supply (for those WTP>0) with the current payment (for those WTP=0). This is an adhoc measure but useful as a means of ascertaining how much more would be paid for improved supply if the current price is taken as the minimum acceptable figure.

Readers unfamiliar with CVM may be concerned that we are deriving a CUE estimate based on a perceived or subjective valuation of supply interruptions. From a technical perspective, the perceived value is indeed the precise and correct economic value for policy-making. Consequently, CVM has been used by governments (including the British Government) to help set tax levels (the environmental cost of aggregates extraction in the UK is estimated using CVM - see Laslett R and G. Yaron (1999), *The Environmental Costs and Benefits of*

the Supply of Aggregates – Phase 2, HMSO, London). The previous decade has seen a growing use of CVM studies in the developing countries. Lescuyer and Weber (1997) reported some 20 studies that estimate the willingness of local people to pay for environmental improvements (public good) or water and sanitation services. Three of these relate to India (Singh et al., 1993, Griffin et al., 1995 and Hadker et al., 1997). A further five studies are drawn together from the 'grey literature' on water sector CVM in India by Sengupta and Poole (1997). Hence, while this study is, to the best of our knowledge, the first application of CVM as a means of estimating the CUE, we have been able to draw on a significant body of relevant literature (some aspects of willingness to pay for improved supply in the developing country electricity-sector have previously been studied. Yaron *et al* (1994), for example, examines the WTP for PV systems).

In the context of WTP for improved electricity supply, the marginal value of supply improvements can be compared with the marginal cost of these improvements to indicate whether this investment is in the national interest. It does not, however, suggest an appropriate tariff level to recoup the cost of this investment (this division is always present when considering optimal system expansion. Optimal expansion is based on LRMC but may be financially unattractive for investing companies (or excessively remunerative). Tariffs are therefore set to cover the costs of optimal system expansion and to achieve an acceptable financial rate of return).

The 'subjective' nature of CVM means that considerable care has to be taken while designing the survey. The core of any CVM study is the description of scenarios. This study is no exception. The scenario description tells respondents how future supply could differ from the current situation. We can have confidence in the maximum amount respondents are willing to pay for this supply only if they understand what is on offer and believe that it can be delivered (minimising so-called 'hypothetical bias'). In addition, the incentives for respondents to behave strategically must be minimised. In effect, respondents must be discouraged against reporting a willingness to pay that they think is more likely to produce a better outcome for them personally.

In order to develop a workable scenario for agricultural consumers, a combination of community meetings, focus groups, and accompanied (observed) interviews in the relevant local language was used in each State. The

industrial consumer scenario was developed using extensive accompanied interviews. The final set of questionnaires used to collect primary data from the industrial and agricultural consumers is attached as Annex 1 to this report.

The CVM approach relies on respondents' perceptions and recall of the supply situation. Consequently, the WTP estimates may be influenced by the season in which the research is done: the worse the current situation, the more people will be willing to pay to fix it. As the fieldwork was undertaken primarily in winter, it may tend to understate the WTP, although asking respondents to recall the supply situation in each season served to minimize this effect.

There is considerable academic debate over the appropriate way of asking for people's WTP (the bid elicitation method) in contingent valuation studies. Dichotomous choice (closed ended) formats typically produce higher response rates and are incentive-compatible but are also vulnerable to 'yea-saying' and require larger sample sizes. In contrast, open-ended formats are more demanding to answer and tend to produce underestimates of the true WTP but require smaller samples. An open-ended question also has to be used for a sub-sample of respondents to produce sensible ranges for dichotomous choice questions.

The influential NOAA panel recommendation in favour of the referendum (dichotomous choice) approach is partly based on the realism of referenda in the USA. This does not apply to India. In addition, the referendum format is statistically inefficient. A large sample is therefore required to infer the WTP of the population (see McFadden 1994). As each consumer group in each state had to be considered separately, the proposed sample size would have been far too small for this approach. Moreover, the choice of a functional form in the analysis of WTP can have a dramatic effect on the mean WTP that is produced.

Of the various open-ended payment vehicles, the straightforward 'What is your maximum WTP?' question did not appear well suited to this study. Pre-testing showed that even where people said they agreed in principle to paying more for an improved service, they found it difficult to name a sum straight away.

The choice thus left open was those of a bidding game and a payment card. Both these methods fall somewhere between strict referendum and open-ended formats. As some respondents are likely to be illiterate, any payment card would have to be read out. CVM bidding games have been used to assess WTP for

improved infrastructure (water and sanitation) in a number of developing countries and successfully in India by Ramasubban *et al.* (1997). This approach was adopted to create the bidding game for industry as shown below.

Those respondents who were willing, in principle at least, to pay for improved electricity supply were presented with the following:

'Now I am going to read you some costs per kWh that a stable and uninterrupted electricity supply might cost you. There would not be any other charge for supply. Please tell me if you would be willing to pay this amount for the improved service. Please do not agree to pay if your company cannot afford it, or if you feel there are other things that are more important for you to spend money on.'

The range of prices for the bidding game (for each consumer group) was created by asking open-ended questions using in-depth interviews in the pre-testing phase[2]. It is generally agreed that the starting point (the first price asked) for the bidding may influence the final price bid. Our initial approach to this potential 'starting point bias' was to start the bidding game at low prices. However, our experience in India and in other developing countries suggests that this causes more problems than it solves[3]. Starting with a very low price tends to signal that state subsidies may be available, making respondents less likely to give a feasible bid. Besides, starting with a low bid runs counter to the established bargaining principle of beginning with a high price. Consequently, the bidding game was always started with the highest price being offered first. To balance the values thus arrived at, it was necessary to derive mean bid values, which can be calculated using two approaches. Approach 1 is simply to calculate each bid as the mid-point between the highest price accepted and the lowest price rejected, i.e. if a respondent says 'Yes' to Rs 4 per kWh but 'No' to Rs 4.5 per kWh, the bid is taken as Rs 4.25 per kWh. Approach 2 is to use survival

[2] This method worked at the pre-test stage as these interviews were not time-constrained in the way that final survey interviews were. Moreover, if respondents could not give a figure it does not matter to the extent that further interviews can be undertaken.

[3] Ghana Urban Water Sector: Demand Assessment and Willingness to Pay Study by LE for DFID

analysis[4] to calculate the proportion of respondents bidding at least each bid price. The area under the survival function in Figure 2.1 is then calculated.

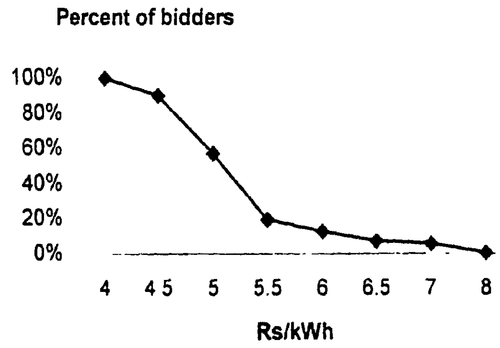


Figure 2.1 Survival function analysis

In practice, the results from both the approaches are virtually identical. Effectively, using these three methods of estimating the CUE produces three different values. The results of all the three methods are compared and then combined to arrive at the best possible estimate of the CUE.

While interpreting the results, the following approximate relationships between the approaches must be kept in mind.

- The direct cost method (or method 1) may overestimate the CUE, since it may be possible to avoid or reduce some of the costs by rescheduling production etc.
- The indirect cost estimate (or Method 2) is likely to underestimate the CUE, since it will simply have shown that industrial and agricultural enterprises are willing to spend, or are already spending, at least this amount (though they may be willing to pay substantially more
- The WTP estimate (or Method 3) will be a statistical estimate of the WTP to avoid interruptions to supply.

[4] Proportion of respondents bidding at least each bid price to those who bid for WTP

2.2 Sample survey method

A two-stage stratified random sampling method was used for collecting field data from both industrial and agricultural consumers in the two states. In this method the sampling is carried out in stages. At the first stage, the first-stage sampling units are sampled by some suitable random method. At the second stage, a sample of second-stage units is selected from each of the selected first-stage units, again by some suitable random method to get a sample of the ultimate sampling units. The sampling units considered in the two stages for both industrial and agricultural consumers are elaborated in the following two sections. Multistage sampling introduces flexibility into the sampling procedure, which is lacking in the simpler methods. It enables a great saving in operational costs, particularly if the survey covers a large area including underdeveloped pockets.

In stratified sampling the population of N units is first divided into sub-populations of N_1, N_2, N_3,.......N_l units, respectively. These sub-populations are non-overlapping, and together they comprise the whole of the population, so that $N_1 + N_2 + N_3 + ... + N_l = N$. The sub-populations are called *strata*. When the strata have been determined, a sample is drawn from each, the drawings being made independently in different strata. The sample sizes within the strata are denoted by n_1, n_2, n_3,.......n_l, respectively. If a simple random sample is taken in each stratum, the whole procedure is described as *stratified random sampling*.

Stratification is a common technique as it may produce again in precision in the estimates of characteristics of the whole population. It may be possible to divide the heterogeneous population into sub-populations, each of which is internally homogeneous. This is suggested by the name strata, with its implication of a division into layers. If each stratum is homogeneous, in that the measurements vary little from one unit to another, a precise estimate of any stratum mean can be obtained from a small sample in that stratum. These estimates can then be obtained from a small sample in that stratum. These estimates can then be combined into a precise estimate for the whole population.

2.2.1 *Industry*

A total of about 550 manufacturing industries, with different levels of contractual load granted by the SEB (state electricity board) in each of the two

states, were randomly selected for a questionnaire survey. Industries were classified into low tension LT (low-tension) and HT (high- tension categories. While selecting the sample industries to be surveyed, the complete range of industries with varying characteristics was considered.

The O&M (operations and maintenance) functions of the SEBs are divided under a number of zones; each zone is further divided into circles; each circle has a number of divisions, and each division is further divided into many subdivisions.

In Haryana, industries with contracted demand below 70 kW are categorised as LT consumers and those with contracted demand of 70 kW and above are categorised as HT consumers. In Karnataka, industries with contracted demand below 63 kVA or any industry with contracted demand (or sanctioned load) given in HP are classified as LT consumers, and those with contracted demand of 63 kVA and above are classified as HT consumers. A detailed classification of LT and HT industries in both the states is presented in Annex 2.

Nine circles were covered in each state, out of the total of 13 circles in Haryana and 10 in Karnataka. The selection of these circles was governed by such parameters as the distribution of various types of industries and the nature of the industry. In each circle, the industrial sample is representative of the typical industry profile of that circle. Spatial distribution of the industrial sample in the two states is presented in Figures 2.2 and 2.3.

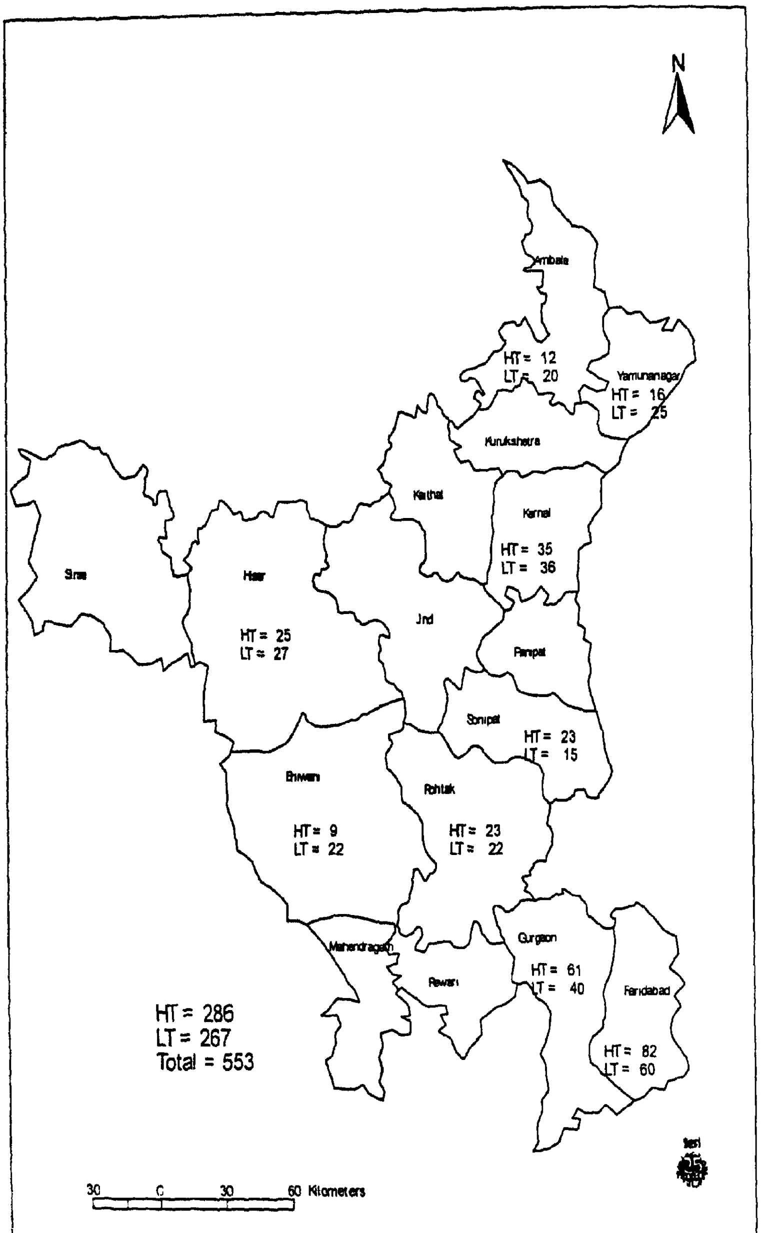


Figure 2.2 Spatial distribution of the industry sample in Haryana

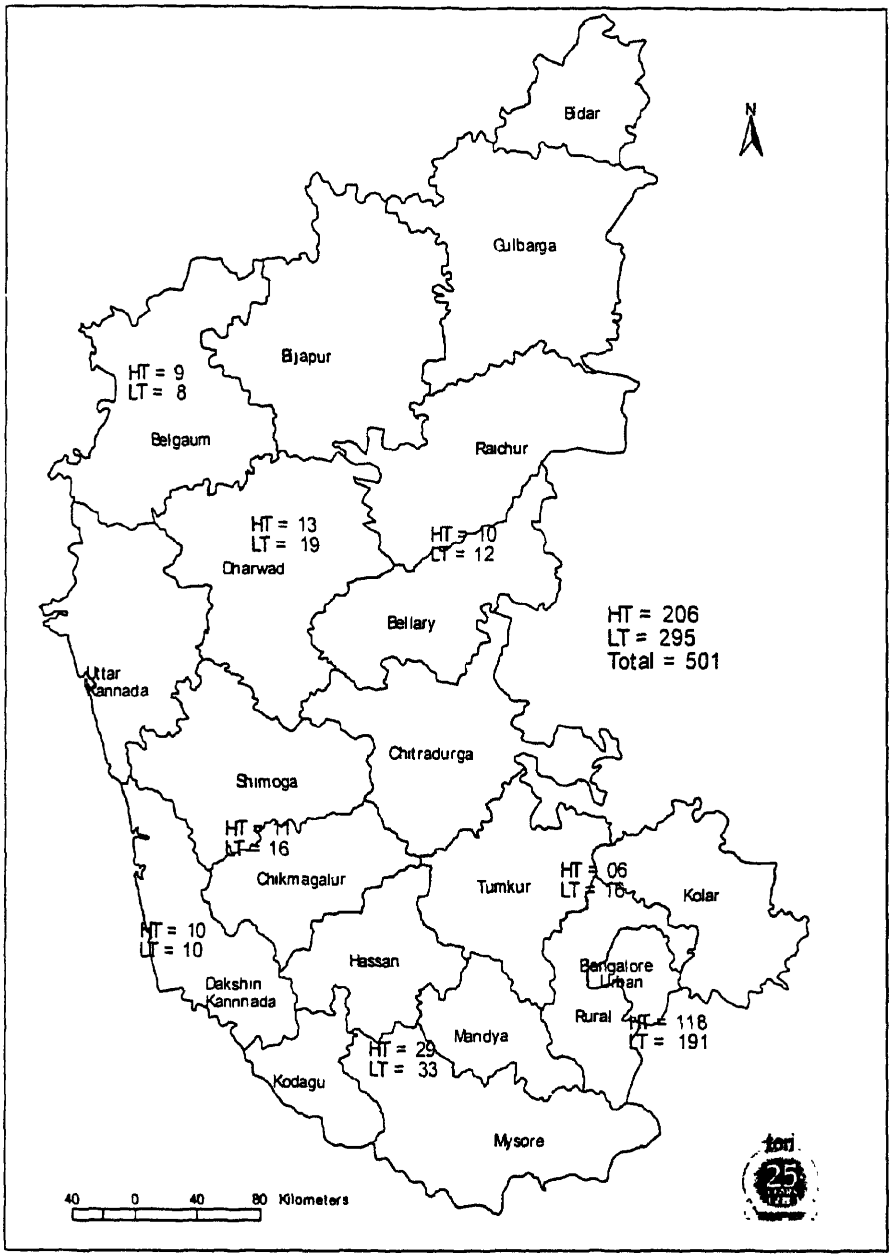


Figure 2.3 Spatial distribution of the industry sample in Karnataka

As mentioned earlier, a two- stage stratified random sampling method was used for collecting field data from industrial consumers in the two states. In the first stage, data were collected from the SEBs for different regions on the number of industrial consumers, their electricity consumption and contractual load. In the second stage, the number of LT and HT consumers (550 being the final sample size in each state) was determined on the basis of actual distribution of consumers in these categories in different circles. The number of industries surveyed under the two categories is given in Tables 2.1 and 2.2 for both the states. An equal number of LT and HT industries were randomly selected in the final sample since very few industries belonged to the HT category. While selecting industrial sample it was ensured that the number of industries of various types is adequate to represent the true population characteristics. The SEB officials were also consulted when deciding on industrial samples so that a wider spread of industries with variations in various characteristics could be covered. Annex 1.1 gives the industrial schedule used for collecting the primary data for the study.

In Haryana, there is only a marginal deviation of realised samples from the proposed samples (Table 2.3). However, as is apparent from Table 2.4, the realised sample of the industries in Karnataka deviates significantly from the proposed sample. The maximum deviation in Karnataka was observed in the HT industries. The main reasons for this deviation are as follows.

- The proposed sample was determined on the basis of state-level data of HT and LT industries (aggregated) provided by the Karnataka Electricity Board. However, in a number of divisions, it was found that some HT industries had either shut down or reduced their contract demand and, therefore, did not qualify for the relevant category. This was more so in the case of EHT (extra-high tension) industries with contracted demand of 1000 kVA and above. As there were very few EHT industries, and an attempt was made to cover most of them in some divisions, any reduction in the total EHT industries present in a division resulted in a reduction of the sample size.
- Some HT industries, e.g. BEML (Bharat Earth Movers Limited) and BHEL (Bharat Heavy Electrical Ltd) in the public sector could not be surveyed as the persons concerned were not available.
- The Gulbarga circle could not be covered due to time constraints.

Table 2.1 Distribution of final sample of industries in Haryana

Zone	Circle	Proposed LT	Proposed HT	Proposed Total	Realised LT	Realised HT	Realised Total
Panchukula	Ambala	17	14	31	19	13	32
	Yamunanagar	27	14	41	25	16	41
	Subtotal	44	28	72	44	29	73
Delhi	Kamal	41	33	74	35	36	71
	Fandabad	63	83	146	37	64	101
	Sonipat	16	27	43	15	23	38
	Gurgaon	39	52	91	54	88	142
	Subtotal	159	195	354	141	211	352
Hisar	Bhiwani	19	11	30	27	25	52
	Rohtak	25	22	47	22	23	45
	Hisar	28	19	47	22	9	31
	Subtotal	72	52	124	71	57	128
Total		275	275	550	256	297	553

Table 2.2 Distribution of final sample of industries in Karnataka

Zone	Circle	Proposed LT	Proposed HT	Proposed Total	Realised LT	Realised HT	Realised Total
Bangalore	Bangalore	121	134	255	191	118	309
	Tumkur	13	6	19	16	6	22
	Subtotal	134	140	274	207	124	331
Mysore	Mysore	40	33	73	23	29	52
	Mangalore	16	25	41	10	10	20
	Shimoga	14	5	19	16	11	27
	Subtotal	70	63	133	49	50	99
Hubli	Belgaum	20	12	32	8	9	17
	Hubli	29	28	57	19	13	32
	Subtotal	49	40	89	27	22	49
Gulbarga	Munirabad	22	32	54	11	11	22
	Subtotal	22	32	54	11	11	22
Total		275	275	550	294	207	501

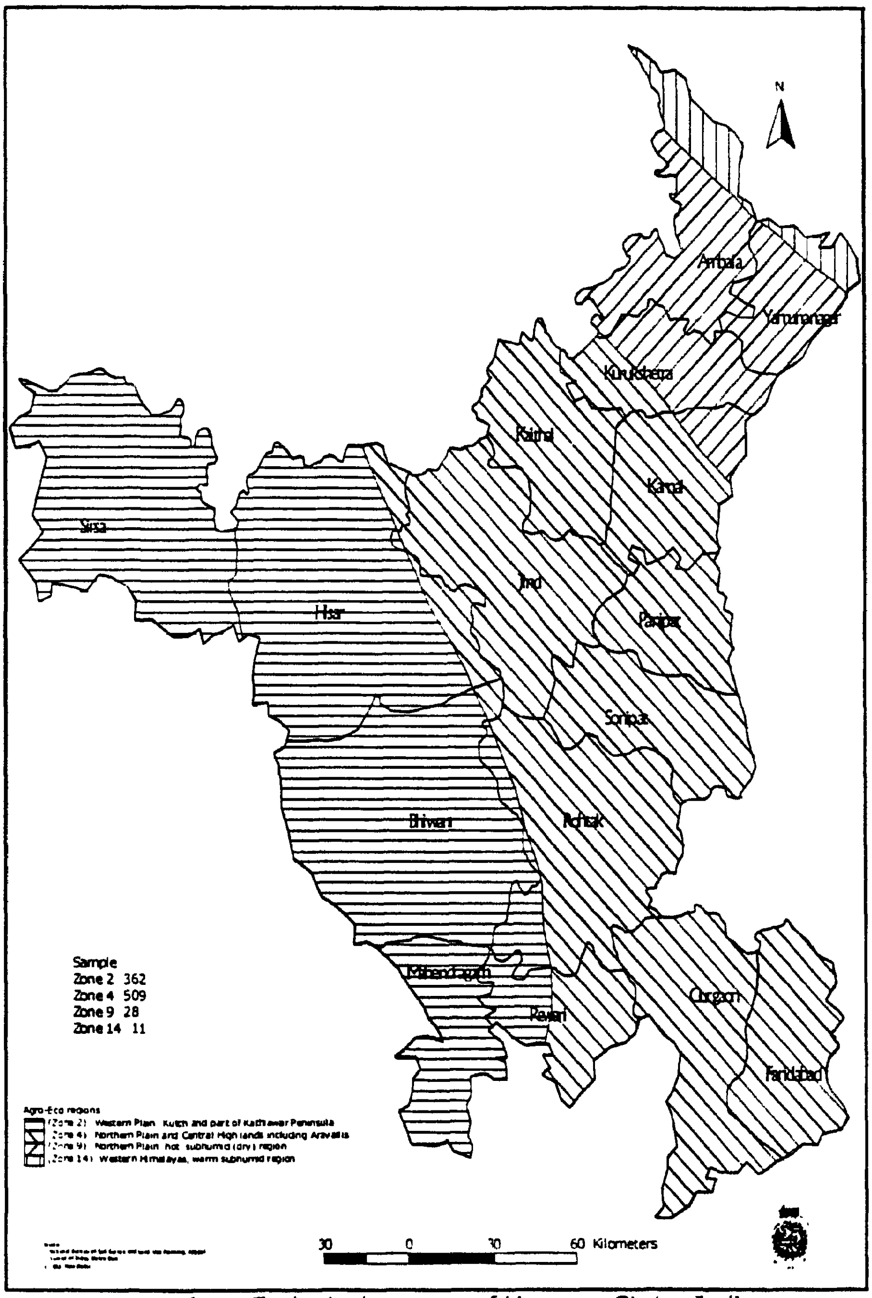
2.2.2 *Agriculture*

As before, the agriculture sector also a two-stage stratified random sampling method was used for collecting field data for the study in the two states. Given the time and resources available, and the fact that at least 30 observations were required to ensure validation of the statistical estimate of the parameters under study, a pre-determined sample of 70 villages at the first stage and of 900 rural households in the second stage (from a selected 30 out of 70 villages) was considered for a questionnaire-based survey in each state.

In the first stage, each state was divided into distinct agro-ecological zones (Figures 2.4 and 2.5). The total number of villages surveyed in a particular zone was decided according to the ratio of the zone's area to the total area of the state. Each zone comprises several districts. In each district, the number of villages to be surveyed was based upon the proportion of net irrigated area to the total cultivable area in the district. After fixing the number of villages to be surveyed in each district, the villages were randomly selected for a questionnaire survey using the village schedule given in Annex 1.2.

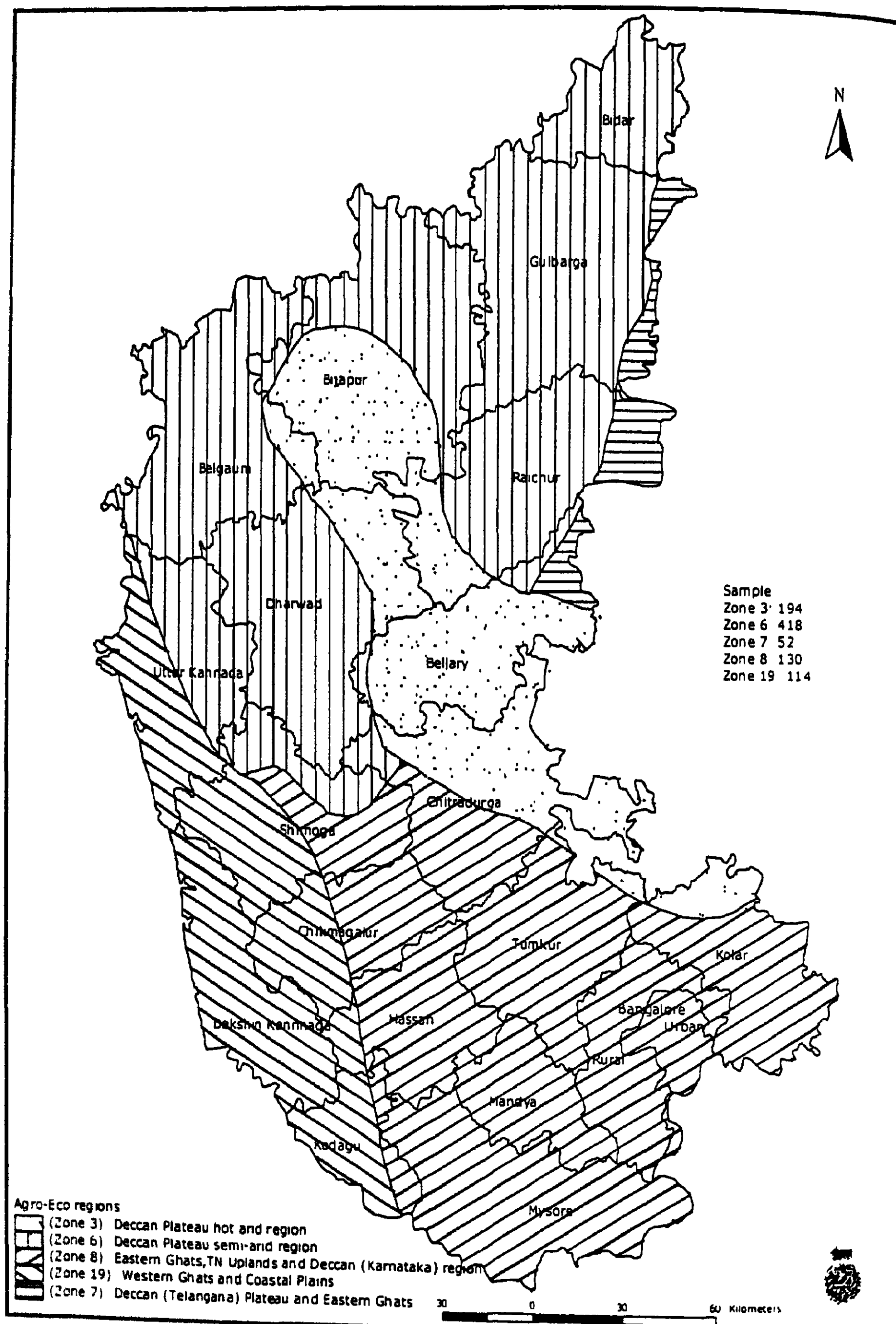
By using a pre-tested village schedule, the following information was collected from the 70 villages, besides data on a number of other variables. Population, number of households and farmers in different land holding categories; average ground water depths during different seasons; major cropping seasons and the crops grown in the village; and the number of diesel and electric pump set owners in these villages.

In the second stage, 30 out of the 70 villages were selected for a detailed stratified random survey using the agricultural schedule presented in Annex 1.3. In each zone the villages were selected on the basis of stratified random sampling, the strata being various groundwater depths. The different classes of depths were 0 – 50 ft, 51 – 100 ft, 101 – 150 ft, 151 – 200 ft, 201 – 250 ft, and >250 ft. After sorting the villages into the appropriate depth-categories, households were selected at random to represent the maximum variation in cropping pattern and type of pump-sets used (electricity or diesel) in the village. In each state, more than 900 households, from the 30 selected villages, were randomly surveyed. The number of households surveyed in different villages was drawn according to the true population distribution of households in a village with different land-holding size (large, medium, semi-medium, small and marginal farmers) and of farmers with and without diesel pump-sets. The observed variation in the proposed and actual samples across agro-ecological zones in the agricultural sector was minor in both states (Tables 2.3 and 2.4). Spatial distribution of the agricultural sample in the two states is presented in Figures 2.4 and 2.5.



Agro-Ecological regions of Haryana State, India

Figure 2.4 Sample distribution of agricultural consumers in Haryana by Agro-Ecological zones



Agro-Ecological zones of Karnataka state, India

Figure 2.5 Sample distribution of agricultural consumers in Karnataka by Agro-Ecological zones

Table 2.3 Distribution of farmers' household's surveyed in Haryana

Zone	Type	Proposed	Realised
2	Western plain, Kutch and part of the Kathiawar peninsula	358	362
4	Northern plains and central highlands including the Aravalis	502	509
9	Northern plain, hot sub-humid (dry) region	28	28
14	Western Himalayas, warm sub-humid region	12	11
	Total	900	910

Table 2.4 Distribution of farmer's household surveyed in Karnataka

Zone	Type	Proposed	Realised
3	Deccan Plateau, hot-arid region	198	194
6	Deccan Plateau, semi-arid region	50	52
7	Deccan (Telangana) Plateau and Eastern Ghats	114	114
8	Eastern Ghats, TN uplands and Deccan (Karnataka region)	411	418
19	Western Ghats and coastal plains	127	130
	All together	900	908

2.3 Data collection and analysis

Two survey agencies, one based in Delhi (Researchers) and the other based in Bangalore (Gallup MBA India), were subcontracted by TERI to conduct the field survey work in Haryana and Karnataka respectively.

Field logistics and data collection exercises were the responsibility of the field supervisors appointed by the survey agencies, one each for the industry and agricultural sectors. The field supervisors and investigators were thoroughly trained by the project team members from TERI. There were a total of 20 investigators and two field supervisors in each state for the data collection exercise. The TERI project team members closely monitored and supervised the entire fieldwork to ensure credibility of the database.

The data collection exercise commenced on 14 December 1998 in Haryana and 23 December 1998 in Karnataka. The two survey agencies completed collection of information from approximately 900 farmers and 550 industries in each of the two states by early May 1999. About 10 percent of the total number of completed questionnaires, both for agriculture and industry, were crosschecked at random, at the field level, by the TERI project team. In Karnataka, staff from TERI, Bangalore office accompanied the survey team throughout the fieldwork.

The data from the questionnaires were then collated as Microsoft Excel spreadsheets. In all, four data sets have been established for data analysis

purposes. The software SPSS (Statistical Package for Social Scientists), Windows version, was used for data analysis and drawing meaningful inferences.

Ideally, for estimating the CUE by the production loss method, it is important that *net* value lost by a consumer due to power outages is ascertained. However, in spite of best efforts by the survey team, a large number of surveyed industries reported only the gross production loss figures without giving any account for (1) value of scrap and (2) production loss which are generally saved by adopting various coping methods to minimize the loss. As a result,

In the industrial sector, the estimated cost of power outages is based on the reported value of *gross* production loss attributable to disrupted power supply. Such is not the case in agriculture sector where the farmers have provided notional values for the increased yield due to additional irrigation made possible by the extra hours electricity is available from the grid. In the agriculture sector, therefore, it is the *net* production loss attributable to power outages is ascertained and used in estimating the CUE. More specifically, the estimation method used in agriculture is based on the incremental crop output not realised (opportunity lost) due to non-availability of power for irrigation. Thus, the approaches used to estimate the CUE in agriculture and industry are different.

3 Results: Industry

Most industrial processes rely heavily on the use of power, and it is imperative for any study on energy to take into account the various strata of industry and the constraints placed upon each by unreliable power supply. Before providing a comprehensive view of the results in the industrial sector, the chapter presents an analysis of electricity consumption, the share of grid power and captive power, current tariff structure, share of electricity in production costs and problems of power supply experienced by the consumers in the two states.

The two surveyed states, Haryana and Karnataka, have different industrial structures and profiles. The major industries in Haryana include automobiles and ancillary parts, electrical appliances, electronics, engineering goods, chemical, leather products, scientific instruments, sugar, and rice-processing industries. Faridabad, Gurgaon, Sonipat, Panipat and Yamuna Nagar are the major industrial centres in the state. As on 1 April, 1998 there were 2 829 HT and 76 018 LT industries in Haryana (Data gathered from Haryana Vidyut Prasaran Nigam (HVPN), Panchkula) In 1995/96 HT industries in Haryana consumed a total of 2017 million kWh (73% in HT and 27% in LT), (Administrative Report, 1995-96, Haryana State Electricity Board) which accounted for about 24% of the total grid consumption in the state. However, the total consumption of electricity in industries from the grid declined to 1973 million kWh in 1997/98 accounting for about 22% of the total consumption (Annual Report on the Working of SEBs and EDs, April 1999, Planning Commission).

Karnataka is one of the most industrially advanced states of the country. The major industries in the state are electronics, computer engineering, telecommunication, aeronautics, machine tools, watch-making, electrical engineering, aluminium, steel, cement, sugar, silk, textiles, mining, food processing, paper, drugs and pharmaceuticals, garments, and edible oils. An interesting fact is that more than 60% of industries in Karnataka are located in and around Bangalore. Bangalore, Mysore, Hubli, Belgaum, and Mangalore are the major industrial centres in the state. Several large industries are located in Bellary and Hospet area. As on 1 April, 1998, there were 2794 HT and about

299 000 LT industries in Karnataka[1]. The total electricity consumption in industries in Karnataka declined from 4546 million kWh in 1995/96 to 4072 million kWh (with 75% in HT and 25% in LT)[2] in 1997/98. Correspondingly, the share of total electricity consumption from the grid in industries declined from 28% to 24%.

3.1 Distribution of industries

The distribution of the LT and HT industries surveyed in the two states, arranged according to the National Industrial Classification (NIC) code, is shown in Table 3.1.

Table 3.1 Sample distribution of the number and type of industries surveyed

Type of manufacturing industry	NIC	Haryana			Karnataka		
	code	HT	LT	Total	HT	LT	Total
Food products and beverages	15	31	27	58	21	20	41
Tobacco products	16				1	1	2
Textiles	17	38	23	61	9	7	16
Wearing apparel. dressing and dying of Fur.	18	4	2	6	2	2	4
Tanning and dressing of leather. Luggage,	19	8	3	11	1	1	2
Wood and products of wood and cork, except	20	4	14	18	2	6	8
Paper and paper products	21	8	5	13	1	9	10
Publishing, printing and reproduction of	22				1	2	3
Coke, refined petroleum products and nuclear	23						
Chemical and chemical products	24	21	19	40	19	15	34
Rubber and plastic products	25	19	23	42	10	28	38
Other non-metallic mineral products	26	13	5	18	13	12	25
Basic metals	27	26	13	39	22	7	29
Fabricated metal products, except machinery	28	28	38	66	28	72	100
Machines and equipment NEC[a]	29	32	44	76	19	40	59
Office, accounting and computing machinery	30		2	2	3		3
Electrical machinery and atus NEC	31	16	6	22	19	25	44
Radio, television and communication	32	5	3	8	7	6	13
Medical, precision, and optical instruments,	33	4	6	10	5	10	15
Motor vehicles, trailers and semi-trailers	34	34	15	49	9	13	22
Other transport equipment	35	5	4	9	4	2	6
Furniture, manufacturing NEC	36	1	4	5	11	16	27
Total		297	256	553	207	294	501

[a]not elsewhere classified

[1] Annual Administrative Report, 1997-98, Karnataka Electricity Board, Bangalore.
[2] Annual Administrative Report, 1997-98, Karnataka Electricity Board, Bangalore.

The profile of these industries in terms of their volume of sales, production cost, sanctioned load, electricity purchased, electricity generated by captive units, production loss due to outages is summarized in Annex 5 (See A 5.1).

The LT industries were further stratified into four groups according to the sanctioned load: up to 20 HP, 21 – 40 HP, 41 – 80 HP, and > 80 HP. Similarly, the HT industries were stratified into four groups according to the contract demand: up to 200 kVA, 200 – 400 kVA, 400 – 600 kVA, and >600 kVA.

3.2 Annual electricity consumption

3.2.1 HT industries

Data on electricity consumption and generation for the period from April 1997 to March 1998 were collected from the industries being surveyed. Table 3.2 shows the average annual electricity consumption in the HT industrial units sampled, classified according to the category of contract demand in the two states.

Table 3.2 Average annual electricity consumption (grid and captive) by a HT industry

	Contract demand (kVA)				
Item	< 200	200 - 400	400- 600	> 600	All
Haryana					
Average electricity used	0.37	0.64	1.12	7.39	2.46
(million kWh)	(122)[a]	(106)	(69)	(240)	(392)
Share of grid(%)	53	55	54	35	38
Share of captive(%)	47	45	46	65	62
Karnataka					
Average electricity used	0 20	0.47	0 90	12.36	4 30
(million kWh)	(102)	(110)	(95)	(265)	(450)
Share of grid(%)	78	57	67	45	46
Share of captive(%)	22	43	33	55	54

[a] Figures within parentheses are coefficient of variation expressed in percentages

In both the states, electricity consumption in HT industries was higher than the corresponding rise in contract demand. In industries with over 600 kVA of contract load, electricity consumption is nearly three times higher in Karnataka whereas in industries with less than 600 kVA of contract load, it is lower. This reflects the fact that the industry structure in the two states is different. Barring the 600 kVA and above category, Haryana has more continuous process industries than Karnataka. For instance, Haryana has predominantly agro-

based and auto components and ancillary parts industries, whereas in Karnataka there is a predominance of batch-process high-tech industries such as telecom, electronics, and engineering.

3.2.2 LT industries

A similar study of the electricity consumption in LT industries was undertaken. Table 3.3 shows the average annual electricity consumption in the LT industrial units sampled classified according to sanctioned load.

Table 3.3 Average annual electricity consumption (grid and captive) in LT industries

Item	Sanctioned load (hp)				
	0 - 20	20 - 40	40 - 80	> 80	All
Haryana					
Average electricity used(million	9.22	26.34	74.97	126.33	50.87
Share of grid(%)	70	56	44	47	49
Share of captive(%)	30	44	56	53	51
Karnataka					
Average electricity used(million	7.38	17.22	34.99	104.35	50.21
Share of grid(%)	72	72	75	55	62
Share of captive(%)	28	28	25	45	38

[a] Figures within parentheses are coefficient of variation.

As the HT industries, an increase in sanctioned load in LT industries causes a rise in power demand that is proportionately higher. Further, electricity consumption, including the share of captive power generation, is higher in Haryana

3.3 Electricity tariffs

The electricity tariff structure for industry in Haryana is different from that in Karnataka. Haryana uses a single-part tariff for both HT and LT industries. Karnataka, on the other hand, applies a two-part tariff, consisting of a demand charge for the contract demand of HT industries (or sanctioned load of LT industries) and an energy charge on a kWh basis.

Apart from this, there are different categories of LT industries (based on sanctioned load) and the tariffs are different for each of them (See Annex 4). The energy rates for HT industries in Karnataka are in a number of steeply increasing blocks.

Therefore, while the currently applicable tariffs can be taken for comparing the results of the three methods of estimating the CUE in Haryana, this is not the case in Karnataka.

In order to have a single tariff rate for both LT and HT industries in Karnataka, it was necessary that weighted average electricity tariff (weight: units of electricity consumed by the industry from the grid annually) in the state for HT and LT industry be estimated from the data. A similar analysis for Haryana was also carried out to capture the true cost of electricity per unit to an industry. The estimates are presented in Table 3.4 and their distribution is shown in Figure 3.1. In Haryana, the HT industry tariff is 17% lower than that in Karnataka, whereas the LT industry tariff is 9% higher. The current tariff schedules for the two states are discussed in Annex 4.

Table 3.4 Weighted average electricity tariff (Rs/kWh)

State	HT	LT	All
Haryana	3.60	3.77	3.61
	(13)[a]	(34)	(14)
Karnataka	4.33	3.46	4.31
	(17)	(57)	(18)

[a] Figures within parentheses are coefficient of variation

3.4 Share of electricity in total production cost

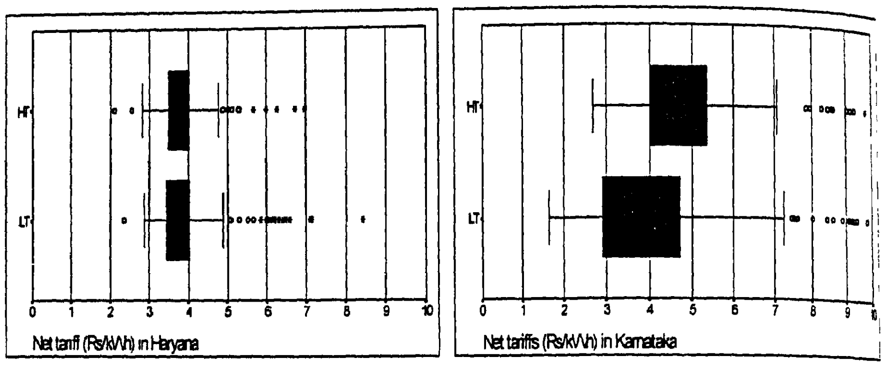


Figure 3.1 Distribution of weighted average electricity tariffs in the two states

While estimating the CUE by the direct method, an important aspect to consider is what part of the total production cost is actually spent on electricity. In each state, respondents from both industrial categories were asked to evaluate their expenditure on electricity as a percentage of the total production cost. The results, classified for HT and LT industries, are given below.

3.4.1 HT industry

The average share of expenditure on electricity with respect to the total unit production cost in HT industries is estimated to be almost 9% in both the states (Table 3.5). However, the share varies within and across the various categories of industries due to variations in production processes and industrial structure. The relative share of expenditure on electricity is higher in Haryana than in Karnataka for industries up to a contract demand of 600 kVA. On the other hand, for industries over 600 kVA of contract demand, the costs are higher in Karnataka as compared to those in Haryana. Although HT tariffs are about 17% lower in Haryana, the share of electricity in total production cost is almost similar in both the states. The reasons are two- fold: First, the share of electricity in total production cost for HT industry in Haryana is higher than Karnataka for all category of industries, excluding industries with over 600 kVA contract demand. This is because these categories of industries in Haryana are more intensive users of electricity as mentioned in section 3.2.1 (see Table 3.2). The higher tariff in Karnataka is offset by the lower power consumption from the

grid by HT industries. Secondly, tariff rates for HT industries in Karnataka increase steeply in proportion to increasing power consumption (see Annex 4).

Table 3.5 Average share (%) of electricity in total production cost in HT industries

Item	Contract demand (kVA)				
	<200	200-400	400-600	>600	All
Haryana					
	10.08	8.87	8.64	7 82	8.90
	(129)[a]	(131)	(108)	(119)	(125)
Karnataka					
	9.27	8.21	7.06	9.69	8.78
	(128)	(131)	(86)	(101)	(117)

[a] Figures within parentheses are coefficient of variation

3.4.2 LT industry

The average share of electricity in the total unit production cost in LT industries is estimated to be about 9% in Haryana and 6% in Karnataka (Table 3.6). The share varies within and across various sanctioned load categories because of variations in the structure and production processes in different industries. In all classes (except in the case of industries with a sanctioned load above 80 HP) the share in Karnataka is lower than that in Haryana.

Table 3.6 Average Share(%) of electricity in total production cost in LT industries

Item	Sanctioned load (HP)				
	0 - 20	20 - 40	40 - 80	> 80	All
Haryana					
	14.38	7.98	7.75	8.26	9.05
	(120)[a]	(121)	(86)	(95)	(120)
Karnataka					
	4.09	4.30	6.27	8.83	6.35
	(118)	(121)	(138)	(134)	(142)

[a] Figures within parenthesis are coefficient of variation

3.5 Problems of power supply

Respondents were asked about the diverse problems related to power supply and the severity of each problem (on a scale of 0 to 5 with 5 implying maximum severity). The score of zero was assigned when there was no response to a particular question. The mean score for each problem was then calculated taking into account the score of zero as well.

Unscheduled outages and voltage fluctuations were ranked as the most severe problems in both Haryana and Karnataka. Both states had a third severe problem too - demand cuts in Haryana and scheduled cuts in Karnataka. (See Figure 3.2). This indicated that the severest problems in the two states are similar (though not their scores) [Demand cuts in Haryana imply that industry cannot use power for production purposes for a notified number of hours in a day, although power is available at supply points. This is similar to scheduled cuts in Karnataka, where power is cut off to industries for a notified number of hours in a day. In comparison demand cuts in Karnataka are mostly applied seasonally, with industries not allowed to use a percentage of their contract demand (as notified)].

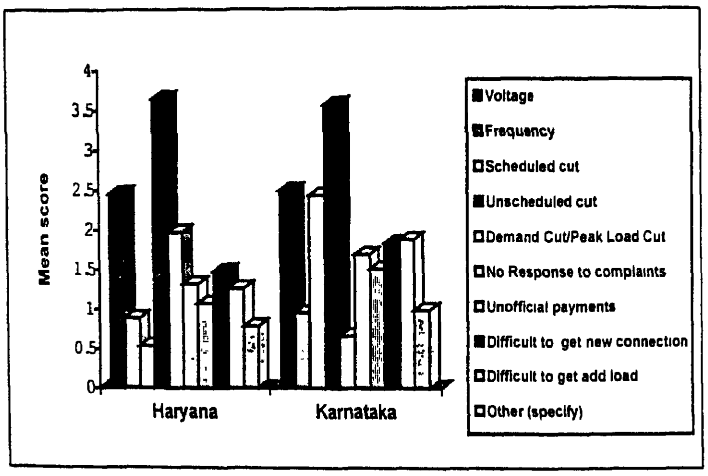


Figure 3.2 Problems of power supply in the two states

The detailed survey results pertaining to the problems of power supply across circles and different industry categories are provided in Annex 5.

3.6 Power cuts

Power cuts (both unscheduled and scheduled) are amongst the most severe problems faced by industries in both states. Based on a recall method, an attempt was made to determine the duration of average power cuts (scheduled, unscheduled, and demand) in LT and HT industries in the two states. The duration of these cuts was then further used to determine the CUE by the first method, namely production value lost due to non-availability of electricity (expressed in terms of value lost per unit of electricity unavailable).

The power cuts faced by both HT and LT industries are higher in Haryana than those in Karnataka. However, in Haryana, there is a marked difference between the duration of power cuts faced — power cuts in HT industries last for 6.6 hours a day as an average, which is almost twice as long as power cuts in the LT industries (3.6 hours). In Karnataka, however, the figures for both categories are almost the same (2.4 hours for HT and 2.3 hours for LT). (Table 3.7).

Table 3.7 Average duration (hours) of daily power cuts

State	HT	LT
Haryana	6.6	3.6
Karnataka	2.4	2.3

Figure 3.7 shows the type of power cuts across different circles in both the states for HT and LT industries separately. In Haryana the power cuts are largely due to demand cuts and unscheduled cuts, whereas, in Karnataka, they are mainly due to scheduled and unscheduled cuts (Table 3.8 and Figure 3.7). On an average, the duration of power cuts is higher in summer than in winter for both the states. The reduction in power cuts in winters is due to reduction in incidence of all three types of cuts. The duration of power cuts in winter is low because of reduction in loads of appliances like air conditioners, water coolers, fans, and refrigerators.

Table 3.8 Average Power cuts in the two states (Hours/day)

Ind	Demand cut		Unscheduled cut		Scheduled cut		All together	
	S	W	S	W	S	W	S	W
Haryana								
HT	3.2	3.1	3.6	2.5	0.3	0.2	7.3	5.9
	(65)[a]	(68)	(62)	(72)	(394)	(416)	(50)	(55)
LT	1.2	1.1	2.7	1.9	0.1	0.1	4.0	3.1
	(141)	(147)	(54)	(68)	(466)	(549)	(56)	(70)
Karnataka								
HT	0.51	0.09	1.62	0.58	1.83	0.23	3.96	0.89
	(222)	(571)	(93)	(155)	(91)	(286)	(69)	(159)
LT	0.18	0.01	1.64	0.44	2.17	0.11	3.99	0.56
	(379)	(834)	(81)	(160)	(72)	(359)	(54)	(158)

[a] Figures within parentheses are coefficient of variation

S = Summer

W = Winter

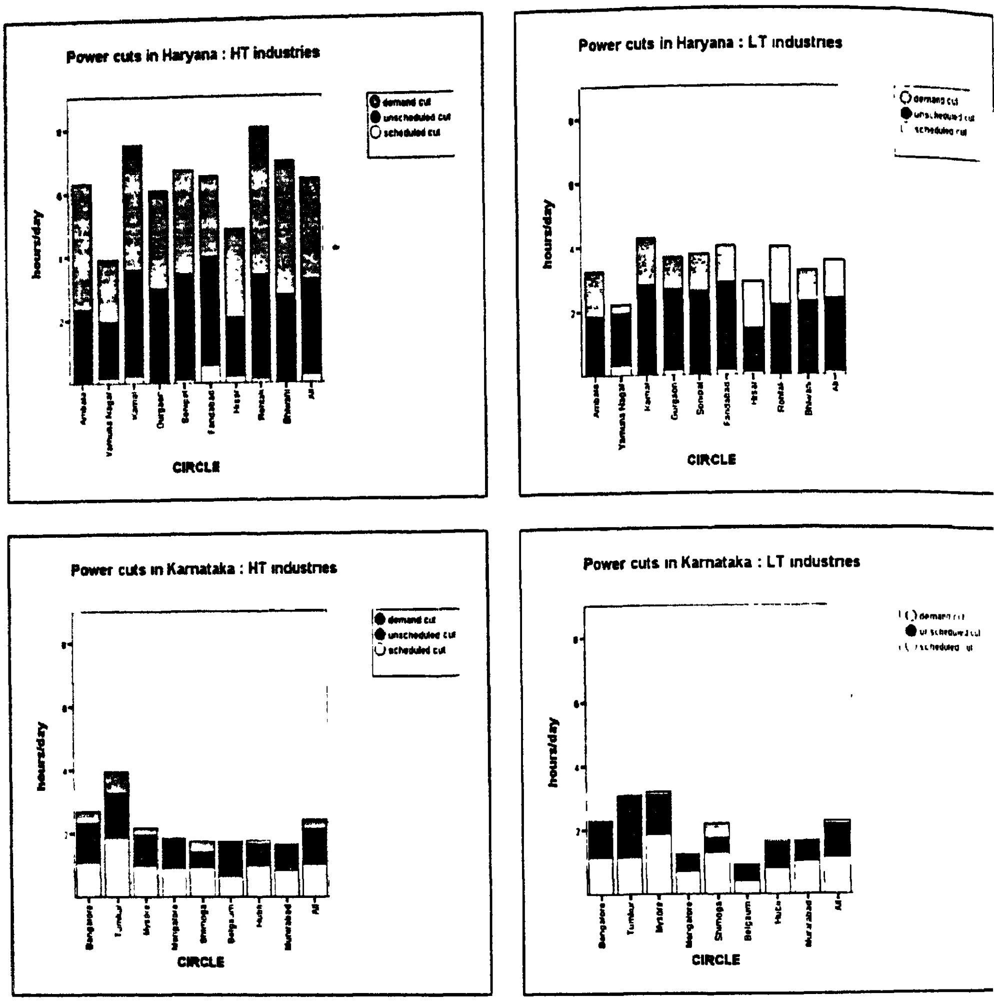


Figure 3.3 Power cuts by electric circles

Annex 5 provides further details of power cuts experienced by LT and HT industries in the two states in each circle.

3.7 Cost of unserved energy using direct assessment: Method 1

The first method of estimating the CUE is based on estimating the value of production lost per unit of power not supplied to industries. The methodology to estimate this value was described in Section 2.1.1.

Of the 553 industries surveyed in Haryana, only 245, comprising of both HT and LT industry, could provide a valid response on value of production lost due to power supply problems. Similarly, in Karnataka, only 255 industries from a total sample of 501 industries could provide a valid response to this question. The weighted average cost of production is given in Table 3.9.

Table 3.9 Weighted[a] average cost of production loss (Rs/kWh)

State	Statistics	HT	LT	Total
Haryana	Number of valid response	146	99	245
	Mean	5.24	6 19	5 26
		(258)[b]	(203)	(256)
Karnataka	Number of valid response	92	162	255
	Mean	22.4	15.46	22.1
		(471)	(229)	(469)

[a] Weighted by number of units consumed by the industries, as the estimate is for every unit of power not available.

[b] Figures within parentheses are coefficient of variation.

The monthly production losses suffered by industries due to power cuts are presented in Table 3.10. It shows that for both HT and LT industries, losses are higher in Karnataka than in Haryana. The losses are higher in Karnataka because both the size of the industry (measured in volume of sales output, Annex 5) and percentage of production loss due to power outage are higher in Karnataka.

Table 3.10 Production cost and loss due to outage

		Production loss				Production cost	
		Million Rupees/annum		% of production cost		Million Rupees / annum	
State	Statistics	HT	LT	HT	LT	HT	LT
Haryana	Number of valid response	145	99	145	99	145	99
	Mean	9.76	0.26	7.60	7.90	165	4.34
		(241)[a]	(195)	(151)	(121)	(213)	(134)
Karnataka	Number of valid response	86	160	86	160	86	160
	Mean	15.4	0.58	12.44	15.27	311	4.80
		(232)	(348)	(116)	(83)	(257)	(175)

[a] Figures within parentheses are coefficient of variation.

Figures 3.4 and 3.5 give the production losses in HT and LT industries under different NIC categories. The figures make it clear that production losses in a majority of the NIC categories are higher in Karnataka . Also in some specific industries, production losses due to power outages are particularly higher, for example, in industry categories like machinery and equipment; radio, television and communication equipment; and motor vehicles and trailers.

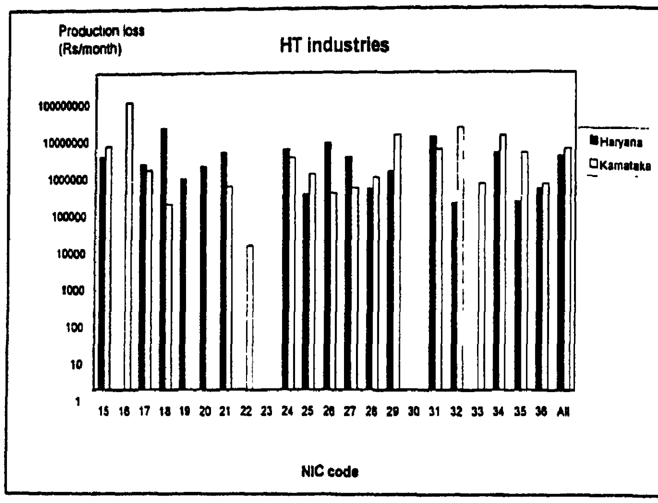


Figure 3.4 Production losses in HT industries

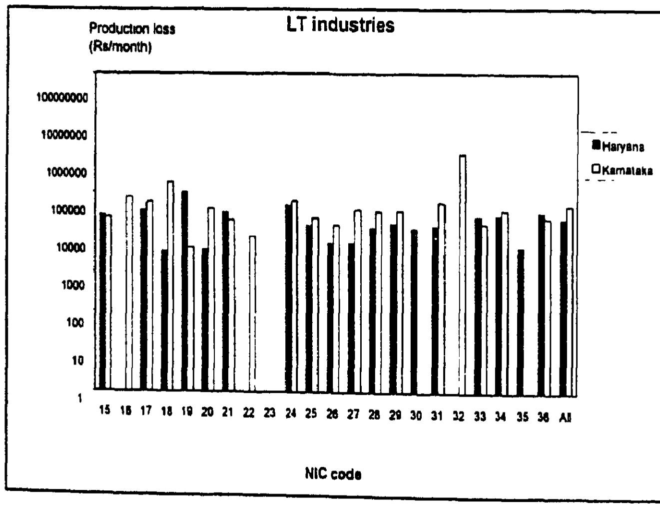


Figure 3.5 Production losses in LT industries

The results presented in Table 3.9 reveal that there is a wide difference in the values of cost of production loss across the two states. The difference is due to the following reasons (1) average production cost per industry is higher in Karnataka (Table 3.10); (2) power cuts are larger in Haryana (Table 3.8), as a result of which more number of captive units have been installed in Haryana to cope with power cuts, and (3) industries in Karnataka are less electricity-intensive than those in Haryana. This is illustrated by the fact that for each Rupee of production cost, the electricity consumption in HT industries in

Haryana is 0.013 kWh compared to 0.006 kWh in Karnataka. The corresponding figures for LT industries are 0.013 and 0.01 kWh respectively.

To elaborate the first point further, production cost usually comprises of cost of raw materials, electricity, labour, factory overheads, etc. Since the share of electricity in total production cost is low in Karnataka, higher losses are incurred by the industries during power failure due to the heavy loss of other inputs. This is especially true if the industry is very sensitive to power. In such industries the complete production batch is scrapped in case of a power cut resulting in a heavy production loss. Industries such as chemicals, telecommunications, electronics, engineering and software are power sensitive. A significant percentage of industries surveyed in Karnataka consist of such industries.

As the duration of power cuts in Haryana are far larger than those in Karnataka, the strategy of industry has been to install captive generation capacity. This is shown by the survey results. Figure 3.6 shows that the installation of captive generation is higher in Haryana, particularly for LT industry. Thus during power outages, a far higher proportion of industries in Haryana resort to captive generation. Production losses in Haryana are therefore considerably less as the industries immediately switch to captive units in case of power cuts. Secondly, the type of products manufactured and the structure of industry are different in the two states, as has been discussed earlier.

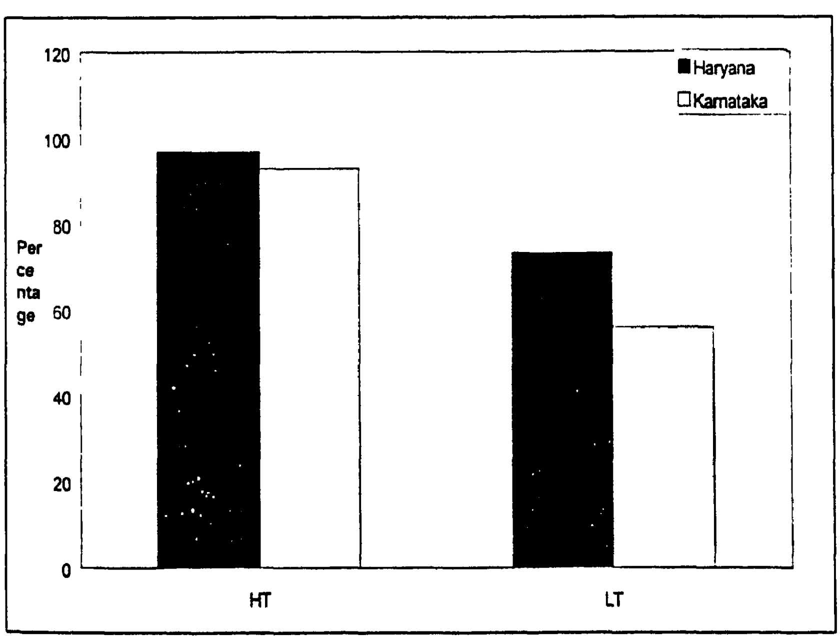


Figure 3.6 Industries with captive generation

Power sensitive[3] industries would most likely opt for captive generation to reduce their losses. HT industries are usually more sensitive to electricity than LT (Table 3.11), as they are largely process industries. Therefore, to reduce the risk of production loss due to power outages, most of the HT industries have opted for captive power, whereas still a significant percentage of LT industries are working without captive power (Figure 3.6).

Table 3.11 Production losses (Rs/kWh) with and without captive power

Captive	Haryana		Karnataka	
Status	HT	LT	HT	LT
Without captive power	1.37	4.21	2.96	12.79
With captive power	5.28	6.62	23.16	17.10

Industries can usually cope with scheduled or demand cuts by rescheduling production or by working overtime. But the only way to cope with unscheduled power cut is to opt for captive power. Since, in Karnataka, power cuts are mostly scheduled or demand cuts, there is less reliance on captive power generation (especially in LT industries). This, however, results in a greater loss of production per unit of power in the event of an unscheduled power cut. Since a higher percentage of industries in Haryana use captive generators to cope with power cuts, the CUE estimate produced by Method 1 is much lower in Haryana.

London Economics (1992) has in an earlier study proven this inverse relationship between duration of power cuts and CUE estimate by Method 1. In a review of the literature on production loss estimates of CUE, London Economics (1992) found that if hours of power cuts increase two-fold, the CUE through production loss method will fall by half.

[3] The electricity sensitivity of industries can be measured from the fact that whenever power outages occur, the resultant production losses are higher than the costs of electricity consumption from the grid during these outages

Figure 3.7 depicts that the cost of opportunities lost to consumer power is far higher in Haryana than in Karnataka during power outages.

The distribution of estimated cost of production losses across HT and LT industries in the two states is shown in Figure 3.8.

3.8 Cost of unserved energy using indirect assessment: Method 2

Using the cost of captive generation of power to estimate the CUE is a very reliable method, especially for the industrial sector. By choosing to generate part or all of their own electricity, profit-maximising consumers reveal that the cost of captive generation is less than the effective cost of the alternative, namely buying all their energy from the utility and suffering outages and other related problems. Empirically, in the long run, the captive power generation unit becomes more and more profitable as the duration of power outages increases. The importance of captive generation in Haryana and Karnataka as discussed in the previous section is a case in point.

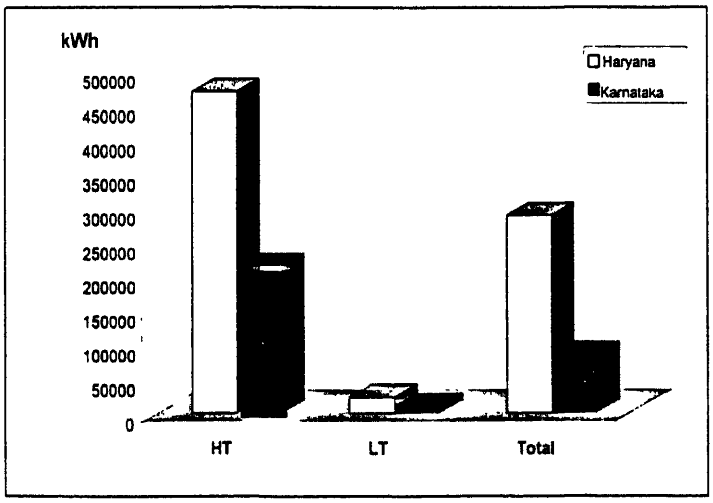


Figure 3.7 Lost opportunities of power consumption

This section discusses the costs of captive generation in the LT and HT industries in the Two states. Beginning with the available data on ownership, capacity, and utilization of generators in LT and HT industries, it goes on to provide estimates of the cost of captive generation. The costs are presented both by as a simple average to show the distribution of these costs across industries and after weighting it with the total units generated annually by industries to show a summarized figure for the whole state. The section concludes with a

discussion of the results of regression analysis to estimate the influence of various parameters such as capacity factor and fuel costs on the costs of captive generation.

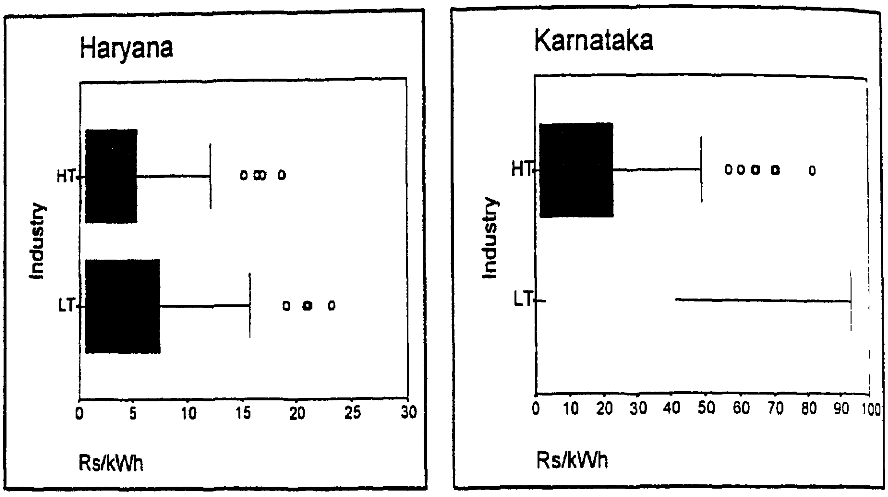


Figure 3.8 Distribution of production losses in industries (Rs/kWh)

3.8.1 Ownership, capacity, and utilisation of generators

HT industry

Table 3.12 and Table 3.13 give the number of generators owned by HT industries in Haryana and Karnataka that formed our sample.

Table 3.12 Ownership, capacity, and utilization of generators in HT industries in Haryana

	Contract demand (kVA)				
Item	<200	200-400	400-600	>600	Total
No of industries with valid response	84	83	50	80	297
No of industries with self generation capacity	80	81	50	77	288
No. of generators/unit	1.5	1.8	1.9	2.9	2.1
Average capacity(kW)	103.4	144.3	216.7	672.9	346.3
	(69)[a]	(74)	(54)	(179)	(226)
Average utilization(hours/year)	1590	1916	1997	2945	2227
	(63)	(75)	(72)	(71)	(77)
Average capacity factor(%)	18.2	21.9	22.8	33.6	25.4

[a] Figures within parentheses are coefficient of variation.

Table 3.13 Ownership, capacity, and utilization generators in HT industries in Karnataka

Item	Contract demand (kVA)				
	<200	200-400	400-600	>600	Total
No. of industries with valid response	50	66	25	66	207
No. of industries with self generation capacity	44	63	24	61	192
No. of generators/unit	1.3	1.6	2.3	3.6	2.2
Average capacity(kW)	102.2	145.5	230.5	881.7	500.4
	(55)[a]	(55)	(51)	(144)	(190)
Average utilization(hours/year)	876	1781	1740	3782	2602
	(82)	(112)	(107)	(71)	(97)
Average capacity factor(%)	10.0	20.3	19.9	43.2	29.7

[a] Figures within parentheses are coefficient of variation.

Thus, industries with less than 200 kVA contract demand in Haryana, use their captive capacity to a lesser extent than those in Karnataka whereas the trend is exactly the opposite with the industries with contract demand over 600 kVA The usage of captive generation in industries in the intermediate range is almost similar in both the states.

LT industry

Table 3.14 and Table 3.15 give the number of generators owned by the HT industries in Haryana and Karnataka in the sample

Table 3.14 Ownership, capacity, and utilization of generators in LT industries in Haryana

	Sanctioned load (hp)				
Item	<20	20-40	40-80	>	Total
No. of industries with valid response	42	125	37	52	256
No. of industries with self-generation capacity	16	92	33	47	188
No. of generators/unit	1	1.05	1.18	1.15	1.09
Average capacity(kW)	12.3	23.2	43.7	65.3	37.3
	(62)[a]	(65)	(60)	(43)	(76)
Average utilization(hours/year)	774	964	1258	1549	1155
	(63)	(60)	(66)	(67)	(69)
Average capacity factor(%)	8.8	11.0	14.4	17.7	13.2

[a] Figures within parentheses are coefficient of variation.

Table 3.15 Ownership, capacity, and utilization of generators in LT industries in Karnatakaó

	Sanctioned load (hp)				
Item	<20	20-40	40-80	>80	Total
Total no of industries surveyed	39	59	103	93	294
No of industries with self generation capacity	10[a]	29	54	72	165
No of generators/unit	1.4[a]	1.03	1.07	1.22	1.15
Average capacity(kW)	13.7	23.2	39.3	65.7	47.3
	(108)[b]	(139)	(60)	(54)	(75)
Average utilization(hours/years)	720	875	745	1220	980
	(58)	(107)	(56)	(125)	(117)
Average capacity factor(%)	8.2	10.0	8.5	13.9	11.2

[a] One industry in this category had very little sanctioned load from the grid and relied exclusively on self-generation with very high captive generation capacity. This industry has been excluded from analysis as an outlier.

[b] Figures within parentheses are coefficient of variation

3.8.2 *Cost of power generation through captive units*

HT industry

The estimation of the cost of power generation by generators in HT industries as described in section 2.1.2 is based on the information obtained on desegregated cost components (i.e. capital cost, annual fuel and maintenance cost) relating to the generator and the annual units of electricity generated.

In Haryana, out of the total 590 generators used in different categories of HT industries, complete data were available for 514 generators.

Table 3.16 Cost of captive power generation in HT industries in Haryana

Item	Contract demand (kVA) <200	200-400	400-600	>600	Total
No. of generators considered for cost analysis	114	129	87	184	514
Unit capital cost(Rs/kW)	6865	7033	4428	8149	6954
	(84)[a]	(161)	(36)	(89)	(112)
Average annual total cost per	484 284	854 921	1 165 634	9 368 423	3 872 944
generatorRs)	(98)	(139)	(105)	(373)	(549)
Capital cost(%)	20.55	24 69	11.11	15.89	16.27
Fuel cost(%)	72.49	68.28	79.89	80.02	79.16
Maintenance cost(%)	7.22	7.03	9.00	4 47	4.76
Annual units generated(%)	186 097	307 885	482 227	3 205 753	1 347 752
	(120)	(121)	(117)	(351)	(510)
Estimated cost of power generation	3.98	4.38	4.21	3.82	4.10
capital + fuel + maintenance(Rs/kWh)	(34)	(50)	(38)	(36)	(41)
Fuel and maintenance cost	2.54	2.61	2.34	1.74	2.34
excluding capital cost (Rs/kWh)	(39)	(46)	(50)	(64)	(50)
Reported cost of power	3.15	3.50	3.43	3.19	3.31
generation(Rs/kWh)	(24)	(23)	(31)	(26)	(26)

[a] Figures within parentheses are coefficient of variation

The estimates provided in Table 3.16 are based on simple averages of the costs across industries and are not weighted by annual units generated in each industry.

The data show that on average it costs Rs 4.10 to generate one unit of electricity as against the reported figure of Rs 3.31. This difference in the two costs could be explained by the fact that the study estimated the economic cost of alternative power generation, whereas the respondents have reported the values based on financial costs using book values of the asset.

As expected, the data in Table 3.12 confirm that the costs of captive power generation decrease in Haryana as the capacity factor increases.

In Karnataka, of the total 428 generators used in different categories of 207 HT industries, complete data were available for 278 generators (Table 3.17)

Table 3.17 Cost of captive power generation in HT industries in Karnataka

Item	Contract demand (kVA)				
	<200	200-400	400-600	>600	Total
No. of generators considered for cost analysis	39	77	29	133	278
Unit capital cost(Rs/kW)	6304	5933	8270	10166	8254
	(29)[a]	(36)	(100)	(68)	(72)
Average annual total cost per generato(Rs)r	277 843	769 374	1 414 050	10 233 266	5 295 358
	(80)	(139)	(95)	(164)	(237)
Capital cost(%)	29.79	15.38	21.31	17.03	17.18
Fuel cost(%)	66.57	81.17	76.30	77.33	77.38
Maintenance cost(%)	3.73	3.46	2.39	5.64	5.47
Annual units generated(kWh)	102 679	313 839	442 562	5 664 481	2 857 483
	(159)	(149)	(112)	(204)	(295)
Estimated cost of power generation capital +	7.8	6.43	5.82	4.62	6.11
fuel + maintenance (Rs /kWh)	(69)	(63)	(36)	(68)	(68)
Fuel and maintenance cost	3.85	3.19	2.66	1.75	2.83
Excluding capital cost (Rs/kWh)	(33)	(39)	(49)	(67)	(52)
Reported cost of power generation(Rs/kWh)	4.05	4.03	4.17	3.67	3.93
	(20)	(20)	(18)	(26)	(22)

[a] Figures within parentheses are coefficient of variation.

Generally, power generation costs across industries (simple means) are higher in Karnataka, largely because of lower capacity factors for all industry categories except > 600 kVA in Karnataka (Figure 3.9). Also, the units of power produced in Karnataka are fewer than or close to those in Haryana for all industry categories except > 600 kVA.

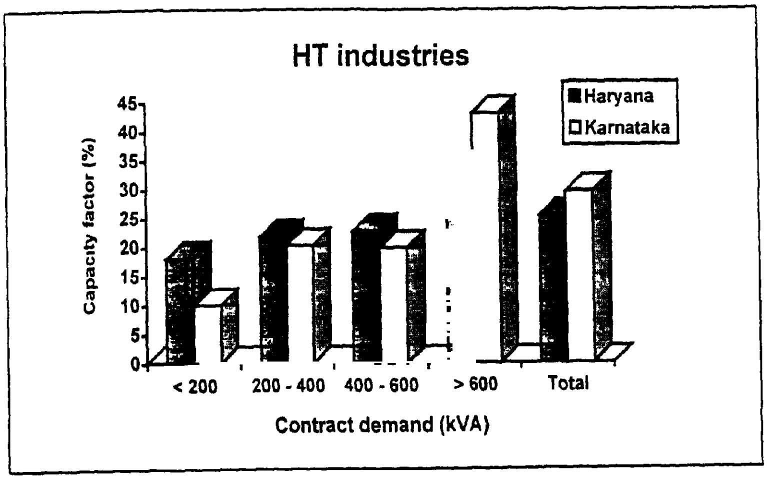


Figure3.9 Capacity factor in HT industries

The distribution of captive generation costs in the two states is shown in Figure 3.10

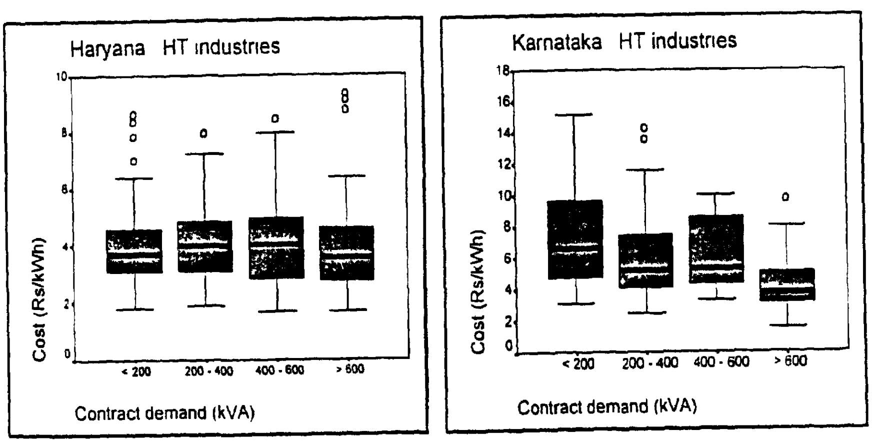


Figure 3.10 Distribution of costs of captive generation

The costs discussed above show the distribution of captive generation costs across industries in Haryana and Karnataka. However, they do not present a correct estimate of the average cost of captive power generation to all the industries taken together. This cost is better estimated by taking the average cost of captive power generation and weighting it with units generated by those industries. This analysis shows that the CUE (derived by Method 2 described in section 2.1.2) is Rs 3.72/kWh in Haryana and Rs 2.61/kWh in Karnataka in HT industries (Table 3.18). The lower average weighted cost for Karnataka is due to two industries, namely MCF (Mangalore Chemicals and Fertilizers) and GIL

(Graphite India Limited). In the case of MCF, the average cost of captive generation is Rs 2.11 per kWh. This low cost of power generation by captive units is due to very high captive capacity (42 MW) and usage of fuel oil for power generation (other industries mainly use diesel). In addition, the share of captive generation by MCF in the total captive generation by all sample HT industries in Karnataka is very high (45%). These two factors are responsible for lowering the weighted cost of captive generation in Karnataka. Similar is the case of GIL, where the average cost of captive generation is Rs 1.54 per kWh, which is unrealistic! If these two industries are removed from the sample, the weighted average cost comes to about Rs 3.70 per kWh for Karnataka as well.

However, if the HT industries in the two states are analysed jointly(including MCF and GIL) , the cost walks out to Rs 3.12/kWh which is below the current existing tariffs (Rs 4.02[4] in Haryana or Rs 4.33[5] in Karnataka), signifying that industries are currently being priced in excess of the costs they would incur for captive generation. HT industries prefer to opt for captive power mainly because grid power is both expensive and unreliable.

This strategy enabled the industries to both reduce costs and production losses in the current circumstances.

Table 3.18 Weighted average costs of captive power generation in HT industries (Rs/kWh)

State	Cost
Haryana	3.72
	(33)[a]
Kamataka	2.61
	(38)
Average	3.12
	(40)

[a] Figures within parentheses are coefficient of variation.

LT industry

In Haryana, of the total 205 generators used in different categories of 256 LT industries, complete data were available for 193 generators. (Table 3.19)

[4] Tariff currently applicable in the state, and not the one estimated in Table 3.4

[5] Estimated in Table 3.4, as application of two-part tariffs make it hard derive a single tariff figure for the industry.

Table 3.19 Cost of captive power generation in LT industries in Haryana

Item	Sanctioned load (hp)				
	0-20	20-40	40-80	> 80	Total
No. of generators considered for cost analysis	14	93	37	49	193
Capital cost (Rs/kW)	7262	5059	6900	7139	6100
	(76)[a]	(64)	(113)	(66)	(82)
Average annual total cost per generator(Rs)	43 266	71 252	190 758	266 232	141 635
	(96)	(105)	(138)	(46)	(116)
Capital cost(%)	26.12	21.90	18.11	20.94	20.56
Fuel Cost(%)	63.58	67.34	71.90	69.76	69.59
Maintenance cost (%)	10.30	10.88	9.98	9.30	9.90
Annual units generated(kWh)	12 411	24 386	62 810	105 344	51 438
	(101)	(118)	(149)	(73)	(134)
Estimated cost of power generation capital	5.88	5.08	4.92	4.59	4.99
+fuel+maint (Rs/kWh)	(32)	(34)	(29)	(39)	(35)
Fuel and maintenance cost of power exculding.	3.6	3.62	3.36	3.20	3.47
capital cost (Rs/kWh)	(32)	(28)	(25)	(31)	(29)
Reported cost of power generation(Rs/kWh)	3.72	3.67	3.54	3.26	3.55
	(27)	(23)	(21)	(25)	(24)

[a] Figures within parentheses are coefficient of variation.

Table 3.19 shows that on average it costs almost Rs 5 to generate one unit of electricity as against the reported figure of Rs 3.55. Also, by the costs of power generation along with the average capacity factor in Table 3.14, it is seen that as the capacity factor of the unit rises, the costs of captive power generation decreases in Haryana.

In Karnataka, of the total 190 generators used in different categories of 294 LT industries, complete data were available for 152 generators (Table 3.20).

Table 3.20 Cost of captive power generation in LT industries in Karnataka

Item	Sanctioned load (hp)				
	0-20	20-40	40-80	> 80	Total
No. of generators considered for cost analysis	9	24	51	68	152
Capital cost(Rs/kW)	10836	8981	6707	6215	7090
	(60)[a]	(116)	(34)	(42)	(71)
Average annual total cost per generator(Rs)	56 342	56 368	95 911	255 393	158 672
	(135)	(117)	(71)	(119)	(143)
Capital cost(%)	34.45	40.29	34.49	20.82	24.97
Fuel Cost(%)	62.42	55.30	61.14	74.74	70.63
Maintenance cost (%)	3.14	4.81	4.42	4.51	4.50
Annual units generated (kWh)	11 902	26 973	29 461	110 032	64 073
	(154)	(257)	(87)	(195)	(238)
Estimated cost of power generation capital	12.83	10.33	7.69	6.59	8
+fuel+maint (Rs/kWh)	(133)	(174)	(58)	(62)	(115)
Fuel & maintenance cost	7.57	3.94	3.78	3.5	3.94
Excluding capital cost (Rs/kWh)	(130)	(30)	(27)	(33)	(71)
Reported cost of power	6.91	4.03	4.13	4	4.24
generation(Rs/kWh)	(100)	(23)	(21)	(22)	(48)

[a] Figures within parentheses are coefficient of variation.

Once again, the cost of captive power generation decreases concomitant with an increase in the capacity factor (Table 3.15).

Generally, power generation costs across LT industries (simple means) are higher in Karnataka, largely because of the lower capacity factors for all categories in Karnataka (Figure 3.11).

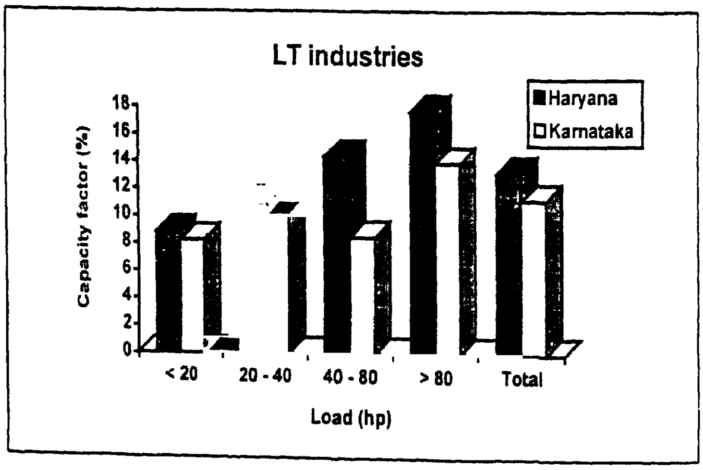


Figure3.11 Capacity factor in LT industries

The distribution of costs of captive generation in the two states in LT industries is shown in Figure 3.16.

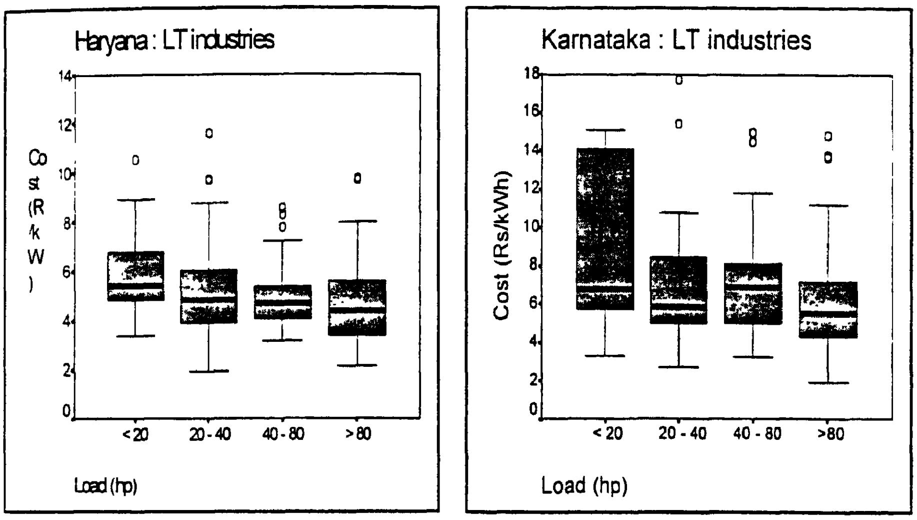


Figure 3.12 Distribution of costs of captive generation in LT industries

As mentioned above, estimating the CUE through Method 2 is better done by taking the average of the cost of captive power generation to industries after weighting it with units generated. This analysis reveals that the CUE derived by Method 2 for LT industries individually for each state as well as jointly is Rs 4.05/ kWh (Table 3.21). These costs are close to the current existing tariffs in Haryana (Rs 4.02) and above those in Karnataka (Rs 3.46) for LT industries, signifying that there is potential for raising tariffs in Karnataka but not in Haryana. This is yet another factor why a higher percentage of LT industries in Haryana resort to captive generations.

Table3.21 Weighted average costs of captive power generation for LT industries (Rs/kWh)

State	Cost
Haryana	4.05
	(34)[a]
Karnataka	4.05
	(54)
Total	4.05
	(45)

[a] Figures within parenthesis are coefficient of variation.

3.8.3 Regression analysis of cost of generation

An econometric analysis was carried out to identify the factors influencing the cost of captive generation in LT and HT industries. Based on scatter plots, a number of linear relationships were established between the cost of captive generation and the following variables:

- capital cost (including installation charges) per kW of capacity of the generators
- expenses on fuel for every kWh electricity generated
- capacity factor of the generator (%); and
- expenses on maintenance per kWh generated.

These variables were regressed on a double log scale, with the cost of captive generation as the endogenous variable. The coefficients of the regression equation provide the elasticity coefficients of each of the explanatory variables listed above.

Table 3.22 provides the elasticity coefficients of each of the explanatory variables with respect to the cost of captive generation for both LT and HT industries in the two states. A detailed output of the regression analysis including t-statistics, F-statistics etc. is presented in Annex 9.

Table 3.22 Elasticity coefficients of cost of captive generation in HT and LT industries

Explanatory variable	HT industries		LT industries	
	Haryana	Karnataka	Haryana	Karnataka
Capital cost per kW	0.130	0.164	0.165	0.218
Capacity factor	-0.162	-0.247	-0.238	-0.357
Fuel cost per unit (Rs/kWh)	0.749	0.714	0.646	0.527
Maintenance cost per unit (Rs/kWh)	0.0843	0.042	0.101	0.0705
Overall adjusted explanatory power of the equation (R^2)	0.998	0.994	0.997	0.995

For example, following conclusions could be drawn from Table 3.22 for HT industries in Haryana on how different explanatory variables influence the cost of captive generation:

- A 1% rise in the capital cost of a generator would lead to a 0.13% rise in the cost of captive generation
- A 1% increase in the capacity factor would decrease the cost of captive generation by 0.16%;
- A 1% increase in the fuel cost would lead to an increase of 0.75% in the cost of captive generation
- A 1% increase in maintenance cost would increase the cost of captive generation by 0.08%.

3.9 Cost of unserved energy using WTP assessment: Method 3

3.9.1 Mean WTP

A detailed description of the type of industry in the survey sample, its energy supply situation, and the problems it faces has been given in earlier sections of this chapter. This section provides the context in which to place the results of the CVM analysis reported below.

In Haryana, above 84% of survey responses were useable in the sense that the de-briefing questions showed that the scenario was understood and accepted as believable. The sample used for the WTP analysis in Haryana, is therefore comprises 457 industries. *Of these, 43% were willing to pay than what they pay at present for improved supply and 57% were not.*

A significant proportion of industries in Haryana are therefore willing to pay for improved supply. A subsequent follow-up question reveals that nearly two out of three of this group would prefer to receive supply from a private supplier, a quarter were indifferent to the source of supply, and about 10% wanted from the State electricity board supply. Those who are willing to pay more for improved supply typically expect this to be provided by a private utility.

In Karnataka, the responses were useable. 94% of cases were valid. *Of these just over half (51%) were willing to pay more than for improved supply and 49% were not.* A small majority of industrial consumers in Karnataka are willing to pay for improved supply. The data were analysed to find out the factors that make certain consumers willing to pay for improved supply, as discussed in the following section.

As in Haryana, those who are willing to pay more for improved supply overwhelmingly preferred a private sector supplier (58%), a third were indifferent and 6% wanted the State electricity board supply power.

In order to calculate the CUE for the industrial sector, it is necessary to weight the WTP bid by each company by the energy purchased by that company. Table 3.23 reports the WTP estimates for both states.

Table 3.23 Estimated CUE in the industrial sector based on WTP weighted by electricity purchased

	LT	LT	HT	HT	ALL	ALL
Parameter	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka
Marginal CUE - WTP for electricity (Rs/kWh) - those who would pay more - weighted by electricity purchased	*4.98*	*4.73*	*5.11*	*4.90*	*5.11*	*4 89*
Proportion (%) of those % willing to pay more per unit	40	57	46	43	43	51
Current purchase cost - sample excluding scenario rejections (Rs/kWh) - weighted	3.74	3.46	3.59	4.35	3.59	4 32
WTP & ATP for electricity (Rs/kWh) - sample excluding scenario rejections - weighted - a measure of average CUE	4 39	4.73	4.21	4.70	4.21	4 70
Sample size excluding scenario rejections only	215	277	242	196	457	473

Note The marginal CUE for all industry is Rs5.11/kWh in Haryana and Rs4.89/kWh in Karnataka[6] Industrial consumers who are willing to pay more for supply improvements in the states are therefore willing to pay similar amounts for a 'good' supply despite the fact that the purchase cost of electricity in Haryana was somewhat lower than that in Karnataka at the time of the survey.

In Haryana, LT consumers are less likely than HT consumers to be willing to pay more for supply improvements (40% vs 46%). The situation is reversed in Karnataka (57% vs 43%). The current price of supply plays a key role here as consumers who currently pay a relatively low price per unit (once all fixed and energy charges are included) are more likely to be willing to pay more for improved supply. This has been further elaborated in the sub-section below.

The average Industry CUE - estimated as the upper bound of current payment and WTP bid – is Rs 4.70/kWh in Karnataka and Rs4.21/kWh in Haryana (Table 3.23). This reflects the fact that a higher proportion of industries in Karnataka are willing to pay more for supply improvements and that their current purchase cost is relatively high.

[6] The WTP of the HT group receives a very high weighting in total industry WTP as this group consumes a large share of total electricity purchased.

Debriefing questions were put to all those respondents who said they were *not* willing to pay for improved supply – about half the sample in Karnataka and just over 60% of industries in Haryana. Table 3.24 reports the reasons why industrial consumers were not willing to pay more for improved supply.

Table 3.24 Reasons why industrial consumers are not willing to pay more

	Haryana(%)		Karnataka(%)
Cannot afford to pay/cost is currently too high	57	45	26
Believes the industrial tariff is already above the cost of supply	64	0	21
Believes supply is cheaper in other states	49	30	10
would rely on self-generation	55	41	34
Rejects scenario	25	9	7

Notes: Haryana col.1 = proportion giving each reason when read the list; Haryana col.2 = proportion giving each reason unprompted; Karnataka = Principal reason only. Although the figures for the two states are not directly comparable, they show that the most important reasons for not paying are the reliance on self-generation and the declared inability to pay more than the current tariff.

Companies that say that they would rely on self-generation in future clearly do face a CUE in the present scenario but this is not captured by the WTP approach. Consequently, the average CUE estimates reported above will be underestimating the CUE for this group comprising those who are assumed to be willing to pay only the current tariff). Therefore, a re-estimate of the average CUE is presented below, after excluding this group from the sample.

In Haryana, the total useable sample falls to 317, of which 60% are willing to pay more for improved supply. This gives a weighted average CUE of Rs 4.59/kWh compared to Rs 4.21/kWh previously. In Karnataka, the useable sample falls to 398, of which 61% are willing to pay more for improved supply. The weighted average CUE in this case also rises to Rs 4.89/kWh compared to the value of Rs 4.70/kWh previously.

It is interesting to compare the marginal CUE estimates from the WTP methodology with those produced by the alternative methods for consistency across the 3 estimation methods, the current purchase cost in the summary Table refers to the entire sample. It differs very slightly from the figures for the sample excluding scenario rejections reported above reported in Sections 2.7 and 2.8. Table 3.25 provides this comparison.

Table 3.26 Summary results - Industry CUE (Rs/kWh)

Method	LT	HT	Total
Haryana			
Production loss (full sample)	6.19	5.24	5.26
Captive (full sample)	4.05	3.70	3.71
WTP (excluding scenario rejections)	4.98	5.11	5.11
Current cost (full sample)	3.77	3.60	3.60
Karnataka			
Production loss (full sample)	15.45	22.39	22.09
Captive (full sample)	4.05	2.61	2.63
WTP (excluding scenario rejections)	4.73	4.90	4.89
Current cost (full sample)	3.46	4.33	4.31

As expected, the WTP estimates of marginal CUE are higher than those based on the cost of captive (alternative) generation and lower than those based on the value of the production loss. The WTP estimates are higher than the estimated cost of captive generation partly because some industries will be willing to pay for supply improvements even though they are not so badly affected as to warrant investment to invest in captive generation. Captive generation is typically a 'dirtier' technology than grid supply and requires staff and financial resources to ensure that adequate fuel stocks are held. This also tends to make WTP estimates of CUE higher than those from captive generation. In contrast, WTP estimates of marginal CUE are lower than the value of production lost because this is a gross (rather than net) value.

The grid supply situation for industries in Haryana has been difficult for a number of years. Consequently, companies have adapted to this by investing extensively on captive generation and rescheduling production (Figure 3.10).

This coping strategy has lowered the estimated CUE produced by Method 1, namely the production loss method. Another reason for this low CUE value is that the duration of industrial power cuts in Haryana are twice as long as those in Karnataka. As noted previously, the London Economics (1992) review of the literature on production loss estimates of CUE found that if hours of power cuts increase two-fold the CUE through this method falls by half.

This coping strategy has also led to a higher proportion of industries in Haryana using backup generation than is the case in Karnataka. This results in the CUE estimated by the indirect method being higher in Karnataka for all industries except the very largest (>600kVA)[7].

The marginal CUE produced by the WTP method is not found to be sensitive to this coping strategy. This is because it reflects the marginal value attributed to supply improvements by those who are willing to pay more for improved supply. It is reassuring to find that *the amount* senior managers are willing to pay for good quality electricity supply is similar in the two states. The effect of adjustment to the existing supply situation is reflected in *the proportion of the sample who would pay for improvement.* This is significantly less in Haryana than Karnataka.

3.9.2 Industry - What Determines Willing to pay more?

Discussions of the WTP method would be incomplete without examining the factors that determine whether an industrial consumer is willing to pay more for improved supply and, if so, how much. The first aspect of the WTP bid – the decision whether to pay more for improved supply or not – was investigated using a Probit regression. The second aspect – the level of the WTP bid *given that* the respondent is willing to pay more for improved supply – was investigated by the least squares regression. This statistical analysis is presented in Annex 9. The principal findings from this analysis are presented below

(a) Explaining WTP estimates for Haryana

The Probit regression shows that industrial consumers are significantly more likely to be willing to pay more for improved electricity supply under the following condition.

- Electricity accounts for only a small proportion of total costs. This is entirely expected as it is easy to agree to pay more to fix problems with your electricity supply if electricity accounts for 5% of total costs; the prospect is more daunting if it for 40% of total costs.

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[7] The lower weighted average unit cost of captive generation in Karnataka reflects the larger size of captive units. The median value of self-generation is 415000 kWh/year in Karnataka versus 90,000 kWh/annum in Haryana. Industries with contract demand at and above 600 kVA find captive generation to be both efficient (low cost) and effective (risk of power outage is reduced). The adoption of captive generators in these industries is almost hundred per cent.

- The consumers pay a *relatively low* price (including demand and energy charges) for each unit of electricity purchased. This applies to consumers in similar demand classes: LT consumers willing to pay for improvement pay a (kWh) weighted average of Rs 3.65/kWh while those unwilling to pay more already pay on average Rs 3.83/kWh. The HT figures are Rs 3.56/kWh versus Rs 3.61/kWh. In order to explain this, consider two LT industries that spend a similar share of total cost on electricity. Industry 1 has a higher contracted load than Industry 2 and both purchase the same amount of energy per month. Industry 1 will have a lower ratio of energy to fixed charges and, given the current tariff structure, will pay more in total charges for each kWh consumed. Industry 1 is less likely to be will to pay more for supply improvement than Industry 2.

- The consumers identify unscheduled outages as a serious problem.

- Having to make unofficial payments (to the State electricity board staff) for repairs (often for transformers) is reported as a serious problem.

- The customers do not believe that tariffs are already too high.

- The customers have at least some captive generation. Industrial consumers in Haryana who have not invested in any captive generation are unlikely to regard poor quality supply a major constraint. Hence they are also less likely to be willing to pay more to fix supply problems.

- The consumers are in certain parts of the state. Respondents in two of the nine supply circles (Faridabad and Rohtak) are far more likely than average to bid for supply improvements while those in two other supply circles (Bhiwani and Hisar) are significantly less likely to bid. This captures two types of effect. Supply interruptions are particularly serious in Faridabad (Figure 3.7).

Variables that have no significant effect on the decision to bid for improved electricity supply include the following.

- Hours of most types of supply interruptions.This holds true even if other variables that capture supply interruptions (scores given to particular

problems of supply and whether production is affected) are excluded from the regression. This result initially appears counter-intuitive but it is simply saying that the average *number of hours* of supply interruptions are a poor guide to how much trouble these interruptions cause to industrial users. For example, some companies are able to reschedule their working day to minimize supply interruptions[8]. *For this reason it is not possible to estimate the elasticity of the CUE to the hours of supply interruption of any given type.*

- Whether the industry is an LT or HT consumer. The size of contracted demand or scheduled load has no effect by itself on the probability of being willing to pay more for supply improvements.

- Problems of voltage fluctuation. This problem is the second most seriously scored of all the problems of supply. However, in contrast to unscheduled outages, companies that consider voltage fluctuation a serious issue are no more likely than others to bid for improved electricity supply. This is likely to be because they have already invested in voltage stabilising equipment to minimize the problem.

Considering those companies that are willing to pay more for improved supply, one can examine the factors (variables) that lead some companies in Haryana to agree to pay significantly more than they do now. This analysis is complicated by the fact that the bidding game produces a limited range of payments per kWh for supply. The standard interval (grouped) regression cannot be used[9] hence the OLS (ordinary least squares)method is used. As the data are grouped into the prices offered and truncated (the range of prices is limited), OLS estimates will be unbiased but inefficient. Thus there is a risk in saying that a variable has no significant effect on the amount bid when it may have a significant effect. To minimize this risk, the following discussion is based

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[8] We asked companies for the duration of their production cycle but many responded in terms of 'time per given unit of output'. This makes it impossible to construct a consistent 'length of production cycle' variable.

[9] The bidding game does not allow for bids below the lowest range on the card or above the highest range. Even if it did, the coefficients produced by the interval regression cannot be interpreted as marginal effects i.e. the effect a particular variable has on the bid level everything else being equal.

on the effect of all variables that are significant at the 10% (rather than 5%) level of significance.

It is important to note that those factors that lead some industrial consumers (43% of the Haryana sample) to agree to bid for improved supply need not explain why one company in this minority group is willing to spend more per unit than another company in the same group. Quite different influences may be at work. *Given* that a company has decided to pay for improved supply, it is likely to bid more per kWh under the following conditions.

- The company currently spends a relatively high amount per kWh on electricity purchased. This appears counter-intuitive but it is not. Companies that are willing to pay more for improved supply are likely to calculate how much they should pay with reference to how much they pay currently. A senior manager might say 'it would be worth our while paying an extra 20% per kWh for an improved electricity supply'. It has already been noted that companies currently paying a relatively high amount per kWh (including all charges) are less likely to bid at all. However, some of these companies will bid (as they produce high-value products that use relatively little electricity). These companies will tend to bid more than others by virtue of bidding a certain mark-up to current charges for improved supply.

- The company has a relatively low sanctioned load: light rather than heavy industry in Haryana bids more per kWh. This may reflect the current tariff structure as LT industries pay more, on average per kWh, once all charges are taken into account than HT consumers or it may reflect higher value products from LT industries. In order to examine this, profits from the reported share of electricity in total costs, electricity purchases and own generation and total sales revenue were imputed. This variable could *not* explain why some companies bid more than others–which supports the tariff hypothesis. However, we suspect that many companies reported inaccurate sales revenue data, which makes our estimate of profits very crude.

- The company experiences serious problems with scheduled outages and does not report that it cannot get a new connection from the grid.

- The company is located in certain parts of the state (as noted in the discussion of the Probit results above).

(b) Explaining WTP estimates for Karnataka

The factors determining the WTP for improved supply in Karnataka are similar in principle but by no means identical to those reported for Haryana. For example, the share of electricity in total costs has the expected sign but is not statistically significant and the data on hours of unscheduled outages are highly significant. The Probit regression shows that industrial consumers are significantly more likely to be willing to pay more for improved electricity supply under the following conditions.

- The consumers pay a *relatively low* amount in total charges per kWh purchased. As is the case in Haryana, those companies that already pay a high price per unit (including all charges) are less likely to agree in principle to pay more for supply improvements.

- The consumers have at least some captive generation (a good indication that proxy for finding the existing grid supply is inadequate).

- The consumers do not already rely largely on self-generation for their electricity supply: improvements to grid supply then become irrelevant.

- The consumers experience relatively high levels of *unscheduled outages* (in summer or winter).

- The consumers identify *scheduled outages* or *demand cuts* as a serious problem.

- The consumers do not believe tariffs are already too high.

- The consumers are in certain parts of the state. Respondents in two of the nine supply circles (Tumkur and Belgaum) are far less likely than average to bid for supply improvements.

As in Haryana, the variables that have no significant effect on the decision to bid for improved electricity supply include the following.

- Hours of most types of supply interruptions (excluding unscheduled outages and possibly demand cuts in summer). As before, this holds true even if other variables that capture supply interruptions (scores given to particular

problems of supply and whether production is affected) are excluded from the regression.

- Whether the company is an LT or HT consumer.

- Problems of voltage fluctuation since as investment on voltage stabilizers is common.

Given that industrial consumers in Karnataka have decided to pay more for improved supply, they are likely to bid more per kWh under the following conditions.

- The consumers currently spend a relatively high amount per kWh on electricity purchased. As in Haryana, those companies that are not dissuaded from bidding because they currently pay a high unit cost for supply are likely to bid a certain amount in addition to their current payment. Hence, high current prices are likely to be associated with higher bids

- The consumers are an HT industry that purchases relatively little energy. This industry –specific effect is not apparent in Haryana and only affects the amount bid for improved supply by those companies in Karnataka that are willing to pay more in principle; it does not affect the probability of being willing to pay more in principle.

- The consumers have found it very difficult to get a new connection from the grid (again in contrast to the Haryana result)

- The consumers are in certain areas of the state.

3.10 *The most likely estimate of the Cost of unserved energy*

As expected the WTP estimates of the marginal CUE are higher than those based on the cost of captive (alternative) generation and lower than those based on the value of production loss for industrial consumers. The WTP estimates are higher than the captive figures partly because some industries are willing to pay more than the current tariffs for supply improvements even though the losses incurred by them due to power shortages/ poor power quality are not so high as to justify captive power generation.

In our view the cost of captive power generation provides the most realistic estimate of CUE. The main reasons for preferring this method is that, first, captive power generation is the most effective coping strategy during power cuts, and, second, data collection is relatively straightforward and precise in this method.

The likely range of CUE based on cost of captive generation in Haryana is Rs 2.22 – 5.79 per kWh and in Karnataka Rs 1.59 – Rs 5.00 per kWh. This range is representative of observations lying between the 5th and 95th percentile. The selection of this range ensures that outliers are not considered.

3.11 *Estimation of state-level economic loss*

The level of economic loss at the state level due to power outages in industries was estimated in the following manner. The value of CUE per kWh estimated by the production loss method multiplied with estimates of industrial power demand during power cuts should give the economic loss at the state level due to power outages. However, it is felt that CUE by production loss method has most likely been overestimated as often industries have revealed gross value of production loss instead of net values. Therefore, to correct the CUE by production loss method estimate, the estimated values of CUE are multiplied by the ratio[10] of value added (VA) to value of output (VO) in industries in the state. The economic loss at the state level is estimated by the following equation:

$$\text{Industrial economic loss due to power outage (Rs)} = \frac{CUE_{\text{prod loss}}\text{ (Rs/kWh)} * \text{Value Addition in industries (Rs)} * \text{Unmet power demand during power outages (kWh)}}{\text{Value of output of Industries (Rs)}}$$

VA/VO ratio for Haryana is 0.137 and for Karnataka 0.22 (1993/94 data from CMIE: Profiles of States, March 1997). The revised CUE by production loss method using these values are (Table 3.26):

Table 3.26 Revised CUE by production loss method (rupees per kWh)

State	Estimate	HT	LT
Haryana	Original	5.24	6.19
	Revised	0.7	0.8
Karnataka	Original	22.4	15.46
	Revised	4.9	3.4

[10] This ratio represents the share of value added component in one unit of output.

The additional power demand or unmet power demand for all HT and LT industries estimated from the survey data in the two states are given in Table 3.27 below.

Table 3.27 Additional power demand of industries (million kWh)

State	HT	LT
Haryana	546	94
Karnataka	339	108

The economic loss for the two states is estimated in Table 3.28. The estimated loss using revised CUE by production loss estimates is 0.5 percent of manufacturing SDP in Haryana and 1.70 percent in Karnataka. Using the original estimates of CUE by production loss method, the economic loss is 3.61 percent in Haryana and 7.71 percent in Karnataka.

Table 3.28 Economic loss to the states in 1998/99 (million rupees)

State	CUE estimate	Add. power demand (million kWh) (1) HT	LT	CUE by production loss (Rs per kWh) (2) HT	LT	Economic Loss (3) = 1 x 2 HT (3a)	LT (3b)	Total Economic Loss (4) = 3a+3b	Manufacturing SDP 1998/99* (5)	Loss as percentage of Manufacturing SDP (6) = 4/5*100
Haryana	Original	546	94	5.24	6.19	2 863	582	3 445	95 328	3.61
	Revised	546	94	0.7	0.8	392	80	472	95 328	0.5
Karnataka	Original	339	108	22.4	15.46	7 601	1 668	9 269	120 222	7.71
	Revised	339	108	4.9	3.4	1 672	367	2 039	120 222	1.70

* SDP estimated from 1980/81 - 1996/97 timeseries of manufacturing SDP given for the two states in EPW Research Foundation (1998) National Accounts Statistics 1950/51 - 1996/97, Mumbai, October 1998.

The above estimation of economic loss is felt to be an overestimate as industries are able to cope with the situation of power cuts by installing captive generators.

4 Results: Agriculture

Agriculture is a vital component of any developing economy and in India, particularly, it contributes considerably to the overall economic situation in the country. India is divided into 20 agro-ecological zones based upon several characteristics, of which soil type and groundwater availability are major considerations[1].

Since energy requirements in agriculture (and the subsequent cost of unserved energy or CUE) are influenced by cropping patterns, soil type, and groundwater availability, the two states under study, Haryana and Karnataka, were first divided into appropriate agro-ecological zones (Figures 2.4 and 2.5). Information was collected in two stages from each zone. In the first stage, 70 villages from different zones in each state were selected at random by using published socio-economic data in consultation with the relevant officials from the state government[2]. The choice of villages was such that these together represented the typical cropping patterns in the two states.

Once the villages had been identified, primary data were collected as per the village schedule given in Annex 1.2. First-hand information on the general characteristics of each village was obtained with respect to the number of farmers, type of crops grown, land holding distribution, depth of the water table, sources of irrigation across different categories of farmers, etc. After eliciting basic information at the village level, approximately 900 farmers were selected at random from about 30 villages out of the total of 70 villages surveyed in the first stage. In the second stage, an agriculture schedule as presented in Annex 1.3 was administered in households with different size of land holdings spread over 30 villages in each state in order to collect the data necessary for estimating the CUE using the three methods discussed in Chapter 2. The results, when

[1] National Bureau of Soil Survey and Land Use Planning (ICAR), 1992, Nagpur.

[2] Statistical Abstract of Karnataka 1993-94. Department of Economics and Statistics, Government of Karnataka, Bangalore 1997 and Statistical Abstract of Haryana 1996-97. Economic and Statistical Organisation, Planning Department, Government of Haryana, 1998.

collated, provide a comprehensive view of the dependence on electricity for irrigation purposes in the agricultural sector.

This chapter is divided into two parts. First part of the chapter comprises of sections 4.1 to 4.7, and is devoted to examining the different aspects of agriculture that are relevant to the study. The information presented in these sections pertains to cropping patterns, depth of the water table, sources of irrigation, distribution of farmers according to land holding size, and the type of power problems faced in the two states. The second part of the chapter, comprising sections 4.8 to 4.10, focuses on the estimations of CUE using the three methods highlighted in Chapter 2.

4.1 Agro-ecological zones and cropping pattern

For the study to be a comprehensive overview of the agricultural scenario in India, it was essential to capture the diversity of crops produced across the different regions of the state, and the different values attached to the crops. Table 4.1 gives the cropping pattern prevalent in the various agro-ecological zones of the two states, providing at a glance, the distinction between the cropping patterns prevalent in Haryana and Karnataka, and the variations across different zones within each state.

Table 4.1 Agro-ecological zones and cropping pattern

Zone No.	Zone	Major Crops
Haryana		
2	Western plain, Kutch and part of Kathiawar peninsula	Wheat, bajra, mustard, cotton, paddy, gram, etc
4	Northern plain and Central high lands including Aravalis	Wheat, paddy, sugarcane, mustard, sunflower, etc
9	Nothern plain, hot subsumed (dry) region	Wheat, paddy, sunflower, mustard, fodder, etc
14	Western Himalayas, warm subhumid region	Wheat, pulses, paddy, vegetables, fodder, etc
Karnataka		
3	Deccan Plateau, hot and region	Sunflower, sugarcane, pulses, millets, etc.
6	Deccan Plateau, semi-and region	Sunflower, sugarcane, cotton, jowar, pulses, paddy, etc
7	Eastern Ghats, TN plands and Deccan (Karnataka) region	Jowar, pulses, sugarcane, wheat, gram, etc.
8	Western Ghats and coastal plains	Paddy, arecanut, ragi, sugarcane, vegetables, coconuts sunflower, pulses etc.
19	Deccan (Telangana) Plateau and Eastern Ghats	Coffee, pepper, cardamom, paddy, groundnut, cotton, etc

Information from the village schedule reveals that in some regions of Haryana, medium and large farmers grow cash crops as well but in Karnataka,

all categories of farmers across different agro-ecological zones cultivate cash crops.

4.2 Depth of the water table and sources of irrigation

Depth of the water table and sources of irrigation determine the manner in which farmers choose to irrigate their fields. To use water from such sources as borewells, open wells, lakes, rivers, and canals, farmers need to pump that water from the source to the field. The cost of pumping water tends to vary with the depth of the water table and/or with sources of water, both of which vary with agro-ecological zones. In order to illustrate the variation in the depth of the water table both within and between the two states surveyed, Table 4.2 provides the average depth in the agro-ecological zones in the two states. Figures 4.1 and 4.2 supplement this information, by depicting the different sources of irrigation across the two states, and the number of consumers in the sample who use each particular source.

Table 4.2 Depth of water table (metres) in different agro-ecological zones

Zone No.	Type	Average depth (m)
Haryana		
2	Western plain, Kutch and part of Kathiawar peninsula	22
4	Northern plain and Central highlands including Aravalis	14
9	Northern plain, hot subhumid (dry) region	14
14	Western Himalayas, warm subhumid region	9
Karnataka		
3	Deccan Plateau, hot arid region	45
6	Deccan Plateau, semi-arid region	46
7	Eastern Ghats, TN Uplands and Deccan (Karnataka) region	24
8	Western Ghats and Coastal Plains	72
19	Deccan (Telangana) Plateau and Eastern Ghats	28

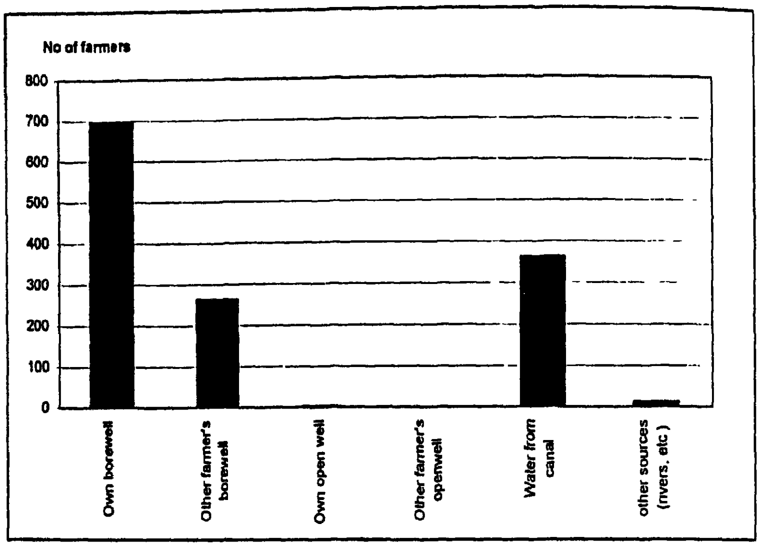


Figure 4.1 Irrigation sources - Haryana

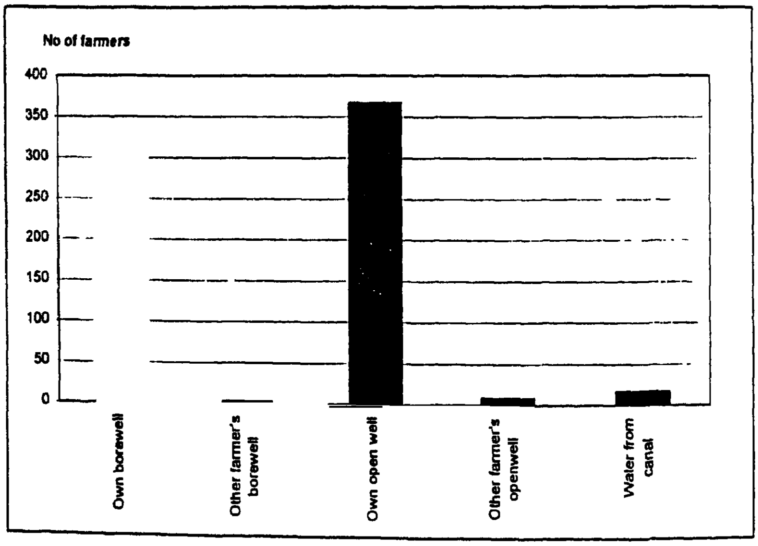


Figure 4.2 Irrigation sources - Karnataka

The ownership of pump-sets is governed by the economic status of the farmer and the economic status of a farmer is usually indicated by his or her holding. Hence, in the subsequent sections, all analysis of the data has been done on the basis of categories of farmers, defined on the basis of the area of agricultural land owned.

4.3 Distribution of farmers by land holding

The size of each farmer's land holding reflects his or her economic potential and hence, while analysing CUE, it is important to consider all categories of farmers, stratified according to the size of land they hold. Table 4.3 shows the distribution of farmers in the sample, stratified by size of the holdings.

Table 4.3 Distribution of sample households in the two states

Description	Marginal (< 1 ha)	Small (1 - 2 ha)	Small - medium (2 - 4 ha)	Medium (4 - 10 ha)	Large (> 10 ha)	All
Haryana						
Number of households surveyed	264	303	194	112	37	910
Percentage of households surveyed	29.0	33.3	21.3	12.3	4	100
Karnataka						
Number of households surveyed	174	291	246	139	58	908
Percentage of households surveyed	19.2	32.0	27.1	15.3	6.4	100

4.4 Expenditure on agricultural activities

In order to get a fair estimate of the CUE, it is important to first determine what percentage of the total expenditure in agriculture is devoted to energy consumption. The study undertook an exhaustive evaluation of the breakdown of total expenditure on agricultural activities in both states (Tables 4.4 and 4.5). Average net agriculture expenditure is broken down into five categories:

- electricity
- diesel
- water
- agricultural transport
- other inputs (seeds, fertilisers, pesticides, etc.)

Annual total expenditure has gone up steadily from marginal to large farmer category in both the states. On an average, a farmer in Haryana spends Rs 40 371 per year (at 1999 prices), which is almost twice as much as that spent by a comparable similar farmer in Karnataka (Rs 22 126 per year). While the extent of difference in agricultural expenditure in the two states is lower for farmers having smaller holdings, the gap increases with the size of the holding. (Tables 4.4 and 4.5).

Table 4.4 Annual expenditure on agriculture by farmers category of different categories: Haryana

Description	Marginal (< 1 ha)	Small (1 - 2 ha)	Small - medium (2 - 4 ha)	Medium (4 - 10 ha)	Large (> 10 ha)	All
Number of farmers	264	303	194	112	37	910
Total agricultural expenditure (Rs)	16 086 (151)[a]	25 220 (80)	45 621 (61)	78 930 (55)	193 777 (64)	40 371 (130)
Expenditure on electricity (%)	7.56	7.77	5.52	4.02	4.58	5.68
Expenditure on diesel (%)	13.63	15.68	18.19	24.12	21.31	19.15
Water for agriculture (%)	6.40	4.34	2.41	1.92	1.61	3.00
Expenditure on agricultural transport (%)	6.04	3.21	2.82	2.32	1.18	2.83
Other agricultural inputs (%)	66.36	69.00	71.06	67.62	71.31	69.33

[a] Figures within parentheses are coefficient of variation

Table 4.5 Annual expenditure on agriculture by farmers of different categories: Karnataka.

Description	Marginal (< 1 ha)	Small (1 - 2 ha)	Small - medium (2 - 4 ha)	Medium (4 - 10 ha)	Large (> 10 ha)	All
Number of farmers	174	291	246	139	58	908
Total agricultural expenditure (Rs)	11 531 (90)[a]	17 491 (64)	24 107 (65)	30 974 (65)	47 548 (53)	22 126 (80)
Expenditure on electricity (%)	7.75	6.06	4.89	5.77	8.22	6.12
Expenditure on diesel (%)	3.15	3.75	3.72	7.90	17.40	6.44
Water for agriculture (%)	1.28	1.12	0.48	0.41	1.12	0.80
Expenditure on agricultural transport (%)	9.85	9.28	7.67	8.09	8.55	8.50
Other agricultural inputs (%)	77.98	79.80	83.24	77.83	64.70	78.14

[a] Figures within parentheses are coefficient of variation

4.5 Distribution of pump-sets by land holding

Figure 4.3 shows the distribution of electric and diesel pump-sets across different farmer categories in Haryana. While almost all the medium and large farmers owned pump-sets (some large farmers owning more than one pump-set each), this was not true for the small and marginal farmers. The proportion of diesel pump-sets is more than that of electrical pump-sets across all categories, except in the large farmer category, where both the figures are almost the same. This is because the depth of the water table in Haryana is less, to which makes the use of diesel pumps more feasible and farmers prefer it to electrical pump-sets because of the unreliability of electricity supply from the grid. The large farmer category requires more irrigation and large capacity electrical pump-sets.

These pump-sets are cheaper to operate than diesel pump-sets and hence the number of diesel and electrical pump-sets is similar in this category.

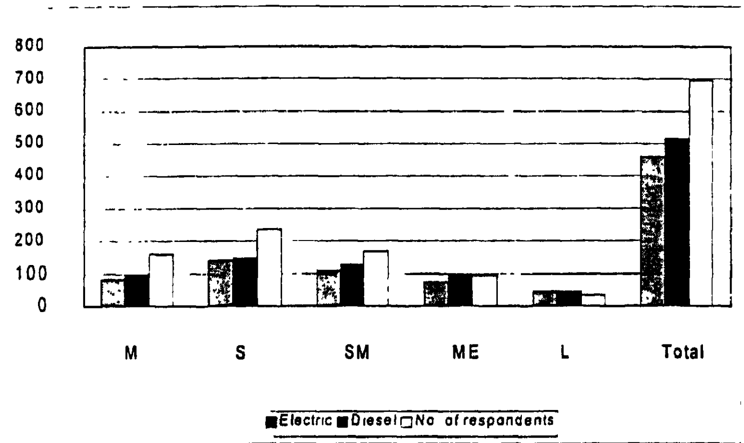


Figure 4.3 Pump set ownership - Haryana

Figures 4.4 shows the pump-set ownership in Karnataka, across various farmer categories. Farmers in all the categories own electrical pump-sets, whereas marginal farmers hardly own diesel pump-sets. More than 90% of the pump-sets in Karnataka are electrical. In Karnataka, the water table is deeper than that in Haryana and hence all categories of farmers have to use electrical pump-sets to extract water for irrigation. Since all categories of farmers grow cash crops, most of them depend on electrical pump-sets.

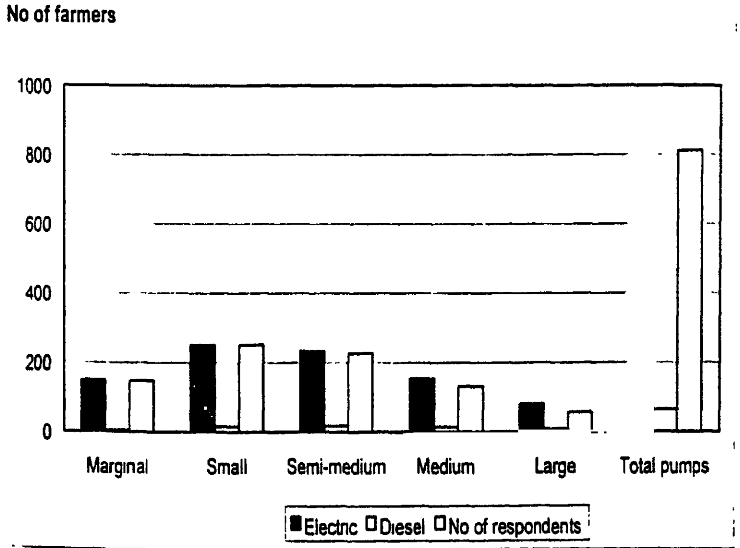


Figure 4.4 Pump set ownership - Karnataka

4.6 Current electricity tariff

The agricultural tariffs in Haryana are in two slabs: for pumps up to 26 brake horse power (bhp) capacity, the electricity charges are either flat or metered, while for pumps of capacity more than 26 bhp, only metered tariff is applicable (Table 4.6). For pumps of capacity more than 26 bhp, the tariff is as follows: fixed charges at Rs 780 per bhp per year and energy charges at the rate of Rs 0.50 per unit as per usage.

For pumps less than 26 bhp, the metered tariff is two tiered. There is a fixed annual charge varying from Rs 540 to Rs 248 per bhp per year and energy charges which vary from 50 paise to 23 paise/kWh. The variation in charges is as per the depth of the groundwater. The flat rate system is applicable to pumps of capacity up to 26 bhp and varies again with the depth of groundwater, ranging from Rs 780 to Rs 360 per year.

In Karnataka, the electricity charge for agriculture is in two slabs. For pumps up to 10 bhp capacity, the charges are Rs 300 per bhp per year and for pumps more than 10 bhp capacity the charges are metered at Rs 0.80 per unit subject to a minimum of Rs 500 per bhp per year. The electricity charges for agricultural sector in Karnataka are given in Table 4.7.

Table 4.6 Tariff structure in Haryana
Up to 26 bhp

	Depth of borewell in feet	Energy charges (Rs/unit)	Yearly fixed charges (per bhp)
	Upto 100	0.50	540
	101 to 150	0.38	410
Metered	151 to 200	0.31	335
	Above 200	0.23	248

Flat rate	Depth of borewell in feet	Yearly charges per bhp (Rs)
	Upto 100	780
	101 to 150	600
	151 to 200	480
	Above 200	360

Above 26 bhp*

Metered	Energy charges (Rates/unit)	Fixed rates per bhp/Annum
	Rs 0.50	Rs 780

* There is no flat rate for this category

Table 4.7 Tariff structure in Karnataka

Up to 10 bhp	Rs 300 per bhp per year
Above 10 bhp	Rs 0.80 per unit subject to a minimum of Rs 500 per bhp/Annum

4.7 Problems with electricity supply

Those farmers who owned electric pump-sets were asked to list the problems that they face with the electricity supply and then rate them on a 5-point scale for severity of the problem faced (5 denoting the most serious problem and 1 the least). The mean rating across the electrical pump-set owners in Haryana is shown in Figure 4.5.

In Haryana, voltage fluctuation was the most serious problem. Several farmers reported that their motors are burnt because of voltage fluctuation as often as four to five times in a year. Difficulty in getting new connections and no response to complaints were also reported as serious problems. The latter, in fact, was rated 3.5, as the farmers felt that if the local feeder transformer is burnt during the crucial irrigation period, the problem was not always fixed promptly by the utility. Though there is a specific schedule of power cuts for different regions, excess loads and other problems often cause unscheduled outages, a problem that was also ranked more than 3 on the severity scale.

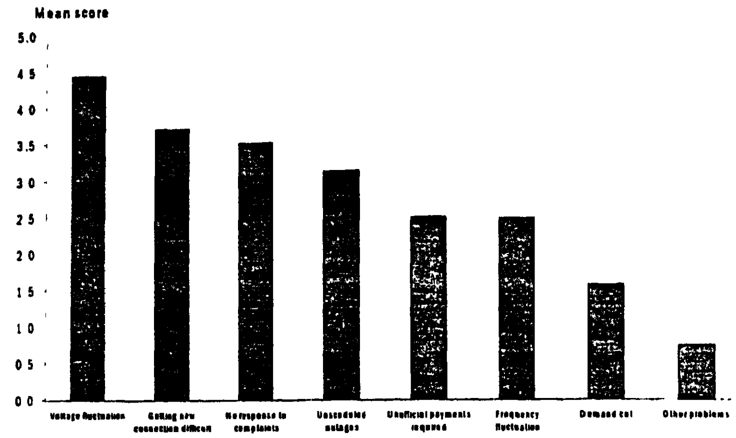


Figure 4.5 Problems with electricity supply in Haryana

In Karnataka, voltage fluctuations and unscheduled power cuts are the most severe problems faced by farmers. Scheduled outages or demand cuts are not perceived as major problems, as farmers would alter the irrigation schedule according to the electricity availability. In Karnataka, no response to complaints and unofficial payments were not perceived as large a problem as in Haryana. These results are reflected in Figure 4.6.

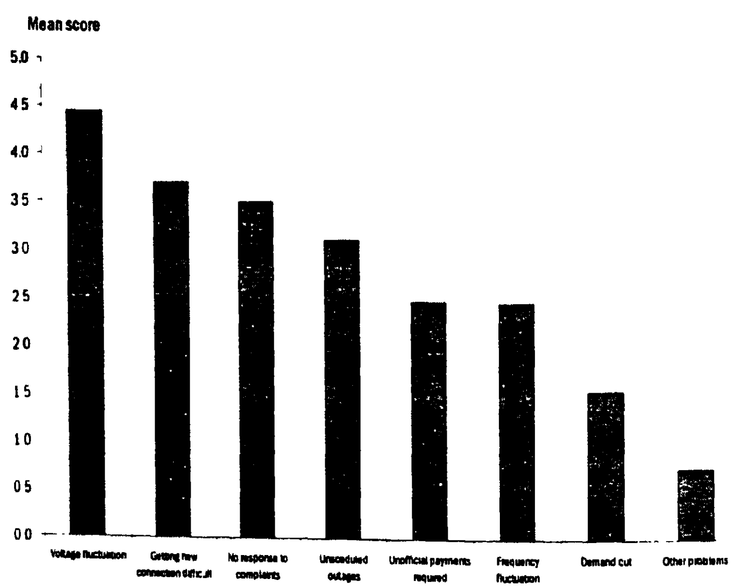


Figure 4.6 Problems with electricity supply in Karnataka

4.8 Cost of unserved energy using direct assessment: Method 1

The CUE in the agriculture sector has been estimated purely on the basis of farmers' perceptions as to whether their agricultural production would increase if they were to receive extra hours of power supply for irrigation from the grid. First, they were asked about their current crop production levels and the hours over which electricity is available from the grid for irrigation in different seasons. Next, assuming that the cropping patterns would remain the same, they were asked to estimate the value of loss in crop production due to lack of electricity from the grid, and the extra hours of power supply required in different seasons.

4.8.1 *Duration of electricity availability and farmers' demand*

Haryana

Table 4.8 shows the average number of hours per day and days per cropping season that electricity supply for irrigation purposes is available from the grid in Haryana. The same table also shows the extra hours of electricity per day demanded by the farmers to overcome the problem of outages in order to maximize their crop production potential.

Table 4.8 Average hours of electricity available and extra hours electricity demanded by the farmers for irrigation in different seasons in Haryana

Season	Electricity demand in hours/day	Marginal (< 1 ha)	Small (1 - 2 ha)	Small - medium (2 - 4 ha)	Medium (4 - 10 ha)	Large (> 10 ha)	All
Kharif	Hours of electricity available	5.73	6.18	5.99	5.76	5.82	5.96
		(33)[a]	(44)	(36)	(40)	(29)	(39)
	Extra hours electricity required	10.14	10.29	10.25	11.63	11.73	10.52
		(63)	(56)	(53)	(56)	(50)	(56)
	Number of days electricity used	47	67	78	157	97	80
		(84)	(117)	(104)	(139)	(64)	(136)
Rabi	Hours of electricity available	6.50	6.98	6.51	6.65	6.86	6.71
		(31)	(39)	(33)	(36)	(19)	(35)
	Extra hours electricity required	4.45	3.95	5.31	5.49	5.14	4.68
		(111)	(108)	(98)	(89)	(80)	(102)
	Number of days electricity used	17	27	45	77	58	38
		(144)	(93)	(119)	(123)	(67)	(137)
Summer	Hours of electricity available	0.64	0.49	0.93	0.65	0.73	0.67
		(273)	(379)	(258)	(313)	(324)	(304)
	Extra hours electricity required	0.81	0.58	1.34	1.14	0.73	0.91
		(326)	(380)	(256)	(307)	(469)	(320)
	Number of days electricity used	2	1	3	3	2	2
		(382)	(827)	(366)	(411)	(469)	(465)

[a] Figures within parentheses are coefficient of variation

It should be noted that the extra number of hours required is the highest (10.5 hours/day) in kharif season, as this is when rice, a highly water-intensive crop, is cultivated in the state. During summer, very few farmers are engaged in cultivation and hence the current hours of electricity and the extra hours required are the lowest.

Karnataka

Table 4.9 shows the average number of hours per day and days per cropping season that electricity supply for irrigation purposes is available from the grid in Karnataka. The same table also shows the extra hours of electricity demanded by the farmers per day to overcome the problem of outages to maximize their crop production potential.

Table 4.9 Average hours of electricity available and extra hours electricity demanded by the farmers for irrigation in different seasons in Karnataka

Electricity demand in hours	Unit	Marginal (< 1 ha)	Small (1 - 2 ha)	Small - medium (2 - 4 ha)	Medium (4 - 10 ha)	Large (> 10 ha)	All
Hours of electricity available: Kharif	Hrs/day	14.89	12.84	12.58	12.05	12 00	12 93
		(43)*	(50)	(51)	(54)	(58)	(50)
Extra hours electricity required Kharif	Hrs/day	1.14	1.99	2.24	2.91	2.98	2 14
		(273)	(166)	(162)	(146)	(177)	(175)
Number of days electricity used: Kharif	Days/season	12	15	21	23	21	18
		(198)	(178)	(132)	(133)	(117)	(152)
Hours of electricity available: Rabi	Hrs/day	11.16	8.83	9.25	8.90	10.45	9 43
		(48)	(57)	(57)	(59)	(60)	(56)
Extra hours electricity required: Rabi	Hrs/day	3.97	6.31	5.58	6.53	5.94	5.71
		(117)	(82)	(89)	(83)	(101)	(91)
Number of days electricity used. Rabi	Days/season	39	50	54	55	64	51
		(101)	(86)	(80)	(79)	(92)	(86)
Hours of electricity available Summer	Hrs/day	8.57	7.00	6.98	7.26	7 65	7 35
		(57)	(59)	(63)	(64)	(58)	(61)
Extra hours electricity required Summer	Hrs/day	6.82	8.86	8.91	8.46	9 49	8 49
		(90)	(69)	(72)	(70)	(67)	(73)
Number of days electricity used. Summer	Days/season	50	47	49	58	58	51
		(128)	(105)	(103)	(110)	(89)	(109)

*Figures within parentheses are coefficient of variation.

In Karnataka, unlike Haryana, agriculture is practised throughout the year. The major requirement for extra hours of irrigation is in the summer months, when water supply at its lowest, due to reduced availability of water in the dams in the state. It should be noted that all categories of farmers require extra hours of electricity in all the seasons, indicating that all categories of farmers engage in year-round agriculture.

4.8.2 *Net cost of production loss during outages*

Haryana

On an average, 49% of those farmers who have electric pump-sets reported that they would gain if power were to be available for longer periods. As expected, the corresponding share was larger (61%) in the case of large farmers (Table 4.10). The average net loss per kWh of electricity not available to farmers in Haryana is estimated to be Rs 1.34 (Table 4.10), as calculated from the net incremental value of extra yield that the farmers perceive they would get from extra hours of electricity. While analysing the cost of production losses due to outages in Haryana, it is observed that it varies considerably within various categories of farmers.

Table 4.10 Average net loss in production per unit of electricity not available in Haryana

Description	Marginal (<1 ha)	Small (1-2 ha)	Small-medium (2-4 ha)	Medium (4-10 ha)	Large (>10 ha)	All
Percent of households reporting loss	28.8	58.5	48.0	50.9	60.8	48.9
Production loss due to outages (%)	9.68	23.04	18.77	20.28	23.84	17.95
Cost (Rs/kWh) of net production loss[a]	1.06	1.92	1.40	0.84	1.70	1.34

[a] estimated values are 5% trimmed mean

The average loss in production suffered by marginal farmers was lower than that suffered by small farmers because they do more subsistence farming. The average cost of production loss per unit of electricity not available decreases from small farmers (Rs 1.92 per kWh) to medium farmers (Rs 0.84 per kWh). This is because as the size of land-holding increases, the capacity to use alternative methods (using diesel or buying water for irrigation) increases during periods of critical irrigation need. However, in the case of large farmers, the average cost of production loss goes up considerably due to outages as compared to the medium farmers since the larger farmers cultivate more cash crops.

Karnataka

Table 4.11 gives the net loss in production reported by farmers in Karnataka due to the non-availability of power. The proportion of households (who depend only on electric pump-sets) reporting production loss due to non-availability of electricity from the grid is lower (46%) in Karnataka. Since farming in Karnataka is centred predominantly around cash crops and the water table lies

deeper as compared to Haryana, production loss due to outages is as high as over 81% in the case of marginal farmers (going down to about 36% in the large-farmer category). Overall, the average crop production loss is 56% in Karnataka. The average net loss in production per unit of electricity not available to farmers in Karnataka goes down significantly from Rs 4.29 per kWh in the case of small farmers to Rs 2.03 in large farmers, with the average for the state being Rs 3.21 per kWh.

Table 4.11 Average net loss in production per unit of electricity not available in Karnataka

Description	Marginal (< 1 ha)	Small (1-2 ha)	Small - medium (2-4 ha)	Medium (4-10 ha)	Large (> 10 ha)	Average for All
Per cent of households reporting loss (%)	41.2	45.8	49.5	44.8	43.1	45.7
Production loss due to outages (%)	81.10	67.80	52.39	48.11	35.98	55.99
Cost (Rs/kWh) of net production loss[a]	3.89	4.29	3.10	2.47	2.03	3.21

[a] estimated values are 5% trimmed mean

The trend in the percentage of production loss due to outages in Karnataka is just the opposite of that in Haryana, with small and marginal farmers reporting the maximum loss due to outages. This is because all categories of farmers in Karnataka grow cash crops – since almost all of them depend upon electrical pump-sets, the losses due to power shortages are higher. The small and marginal farmers reported maximum loss due to outages because mostly they own only one pump-set and do not have the back-up facility of diesel pump-sets. With increase in the land-holding size, the capacity to own multiple pump-sets (which could fulfil the total demand for irrigation during the availability of power) and/or diesel pump-sets as back-up pumps increases and hence the loss per unit of electricity not available decreases.

Figure 4.7 compares the cost of production loss per unit of electricity not available, classified according to the farmers' land-holdings in the two states.

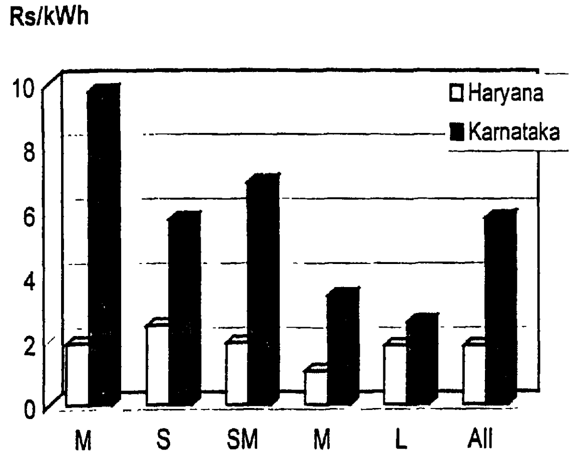


Figure 4.7 Average net loss in production

The values shown in Figure 4.7 are different from the ones presented in Tables 4.10 and 4.11 because these tables present '5% trimmed means' where the figure does not consider the trimmed means.

4.9 Cost of unserved energy using indirect assessment: Method 2

4.9.1 Ownership, capacity, and use of pump-sets

Haryana

The 910 households surveyed in Haryana owned 459 electric pump-sets and 516 owned diesel pump-sets. Data from only those households who owned pump-sets were analysed to estimate the average ownership of electric and diesel pump-sets, their annual utilization, and average load factor across different categories of farmers in Haryana (Table 4.12).

Table 4.12 Ownership, capacity, use, and load factor of pump-sets in Haryana

Description	Marginal (< 1 ha)	Small (1-2 ha)	Small-medium (2-4 ha)	Medium (4-10 ha)	Large (> 10 ha)	Total/ Average
No. of electrical pump-sets	84	143	110	76	46	459
No. of diesel pump-sets	98	148	128	96	46	516
No. of farmers having pump-sets	161	237	170	93	34	695
households with pump-sets (%)	60.98	78.22	87.63	83.04	91.89	76.37
No. of electrical pump-sets per household	0.32	0.47	0.57	0.68	1.24	0.50
No. of diesel pump-sets per household	0.37	0.49	0.66	0.86	1.24	0.57
Average capacity of electrical pump-	5.6	5.3	5.3	5.5	8.0	5.6

Description	Marginal (< 1 ha)	Small (1-2 ha)	Small - medium (2-4 ha)	Medium (4-10 ha)	Large (> 10 ha)	Total/ Average
sets (KW)	(104)[a]	(92)	(27)	(27)	(40)	(72)
Average capacity of diesel pump-sets	6.1	6.0	5.9	6.4	6.4	6.1
(KW)	(17)	(18)	(18)	(20)	(10)	(18)
Average capacity utilization of electric	393.2	554.2	687.8	1002.0	1066.8	668.2
pump-sets[b] (hours/year)	(99)	(82)	(66)	(93)	(51)	(89)
Average capacity utilization of diesel	420.6	519.4	654.6	841.6	920.8	630.0
pump-sets[b] (hours/year)	(81)	(66)	(77)	(79)	(68)	(81)
Average load factor of electrical pump-sets[b] (%)	4.49	6.33	7.85	11.44	12.18	7.63
Average load factor of diesel pump-sets[b] (%)	4.80	5.93	7.47	9.61	10.51	7.19

[a] Figures within parentheses are coefficient of variation.

[b] Number of valid cases in each category are the same as those considered in Table 4.8

Karnataka

In Karnataka, three types of pump-sets are used for irrigation: electric, diesel, and kerosene.

The 908 households surveyed in Karnataka owned 870 electric pump-sets, 63 diesel pump-sets, and only 7 kerosene pump-sets. Hence, only electric and diesel pump-sets have been considered. Table 4.13 gives the average ownership, capacity, and utilization of electric and diesel pump-sets across different categories of farmers in Karnataka. The relative popularity of electrical pump-sets amongst the farmers here, as compared to Haryana, can be explained by the fact that water table is deeper and electricity tariffs are lower, as explained earlier.

Table 4.13 Ownership, capacity, use, and load factor of pump-sets in Karnataka

Description	Marginal (< 1 ha)	Small (1-2 ha)	Small - medium (2-4 ha)	Medium (4-10 ha)	Large (> 10 ha)	Total Average
No of electrical pump-sets	150	251	235	154	80	870
No. of diesel pump-sets	6	16	18	14	9	63
No of households with pump-sets	148	251	227	131	55	812
households with pump-sets (%)	85.06	86.25	92.28	94.24	94 83	89 43
No of electrical pump-sets per household	0.86	0.86	0.96	1.11	1 38	0 96
No. of diesel pump-sets per household	0.03	0.05	0.07	0.10	0 16	0 07
Average capacity of electrical pump-sets (KW)	3.98	4.80	5.16	5.82	7.33	5 17
	(40)[a]	(28)	(24)	(51)	(95)	(55)
Average capacity of diesel pump-sets (KW)	5.17	5.03	8.17	11.71	22 89	9 95
	(31)	(16)	(61)	(66)	(45)	(83)
Average capacity utilisation electric pump sets[b]	714	797	990	1008	1210	912

Description	Marginal (< 1 ha)	Small (1-2 ha)	Small-medium (2-4 ha)	Medium (4-10 ha)	Large (> 10 ha)	Total/ Average
(hours/year)	(96)	(85)	(81)	(75)	(66)	(83)
Average capacity utilisation diesel pump sets[b]	113	302	370	109	na	265
(hours/year)	(36)	(51)	(56)	(30)	na	(70)
Average load factor of electrical pump sets[b] (%)	8.16	9.10	11.30	11.51	13.81	10.41
Average load factor of diesel pump sets[b] (%)	1.29	3.45	4.23	1.25	na	3.02

[a]Figures within parentheses are coefficient of variation.

[b]Number of valid cases in each category are same as those considered in Table 4.9

4.9.2 *Cost of running a diesel pump-set and an electric pump-set*

Haryana

Table 4.14 shows the comparative costs of running diesel and electric pump-sets for irrigation in Haryana. The average capital cost of a diesel pump-set of 1 kW capacity is about 50% (Rs 3288) of that of an equivalent capacity electric pump-set at 1999 prices (Rs 6850). Taking into account a 10% annual discount rate and the reported lives of electric and diesel pump-sets, the capital costs of diesel and electric pump sets were converted into annualised capital cost. Annual fuel costs and annual maintenance costs were added to the annualised capital cost in order to obtain the total annual cost per pump-set (Table 4.14).

In electric pump-sets, approximately 37% of the total cost is incurred on electricity whereas in diesel pump-sets it is approximately 62%. This is because electrical pump-sets are costlier than diesel pump-sets and, as a fuel, diesel is costlier than electricity. Electricity is provided at a flat rate and hence, for the same number of hours of operation, diesel proves to be costlier. Interestingly, as the land-holding increases, the capacity utilisation factor of diesel pump-sets increases from 4.8% in marginal farmers to 10.5% in large farmers, with the overall average being a little over 7.2% (Table 4.12). Similarly, the capacity utilisation factor of electric pump-sets steadily increases from 4.5% in marginal farmers to 12.1% in large farmers, with the overall average being 7.6%.

Also, the average total cost of running an electric pump-set decreases with an increase in the land-holding. This is primarily due to the higher utilisation of pump-sets by farmers with larger land-holding. In the case of large farmers, the total running cost increases as they frequently own multiple pump-sets and each is used less intensively.

The average cost of running a diesel pump-set varies between Rs 3.31/ kWh in the large farmer category to Rs 4.12/ kWh in the semi-medium farmer category. As mentioned earlier, these cost estimates reflect the average utilization factor of a diesel pump set. The higher the capacity utilization factor, the lower would be the average cost of pumping.

Table 4.14 Cost comparison of electric and diesel pump sets in Haryana (at 1999 prices)

Description	Marginal (< 1 ha)	Small (1-2 ha)	Small - medium (2-4 ha)	Medium (4-10 ha)	Large (> 10 ha)	Total/ Average
Electrical pump-sets						
No. of valid cases	83	129	101	68	40	421
Capital cost (Rs/KW)	5799	6561	7084	7573	8144	6850
	(56)[a]	(71)	(68)	(82)	(72)	(72)
Annual total cost per pump-set (Rs)	10473	11580	12971	13520	21934	12993
	(38)	(45)	(48)	(45)	(44)	(51)
Capital cost (%)	43	46	45	46	45	45
Electricity cost (%)	38	38	37	36	38	37
Maintenance cost (%)	18	16	18	18	17	18
Annual output (in kWh equivalent (kWh)	2256	2856	3847	5250	7935	3845
	(167)	(114)	(78)	(100)	(72)	(111)
Average cost (electricity only)[b] (Rs/kWh)	1.61	1.50	1.09	0.97	1.85	1.32
Average cost (electricity + maintenance only)[b] (Rs/kWh)	2.28	2.20	1.57	1.14	1.95	1.66
Average cost (electricity + maintenance + Capital)[b] (Rs/kWh)	3.92	3.84	2.76	1.94	2.30	2.92
Diesel pump-sets						
No. of valid cases	79	129	105	80	39	432
Capital cost (Rs/kWh)	2150	2874	4364	3718	3175	3288
	(118)	(121)	(99)	(117)	(151)	(119)
Annual total cost per pump set (Rs)	8524	10573	14635	17534	18661	13196
	(56)	(59)	(56)	(68)	(69)	(70)
Average capital cost (%)	24	25	27	21	18	24
Average fuel cost (%)	57	58	58	67	69	62
Average maintenance cost (%)	18	17	15	13	13	15
Annual output (in kWh equivalent (kWh)	2023	2410	2928	4103	5006	3010
	(80)	(64)	(68)	(70)	(74)	(79)
Average cost (diesel only)[b] (Rs/kWh)	2.31	2.40	2.69	2.67	2.51	2 51
Average cost (diesel + maintenance only)[b] (Rs/kWh)	3.02	3.07	3.33	3.17	2.92	3 13
Average cost (diesel + maintenance + capital)[b] (Rs/kWh)	3.83	3.79	4.12	3.78	3.31	3 84

[a] Figures within parentheses are coefficient of variation

[b] Estimated values are 5% trimmed mean

Karnataka

Table 4.15 compares the costs for running diesel and electric pump-set for irrigation in Karnataka. As in Haryana, the average capital cost of a diesel pump-set is about half (Rs 4496 per kW) that of an electric pump-set (Rs 8654 per kW) at 1999 prices. The capital cost of the pump-sets were discounted at 10% annual rate of interest over its reported life to estimate the annualized capital cost of pump-set in each category of farmers. These annualized capital costs were added further to the annual fuel and maintenance costs to estimate the total annual cost of running a pump-set. The annual total cost of a typical electric pump-set in Karnataka (Rs 11 703) is estimated to be marginally lower than that in Haryana (Rs 12481). However, it may be noted that very few households in Karnataka use diesel pump-sets for irrigation.

While analysing the data across different farmer-categories, it is seen that the share of electricity in the total running cost of an electric pump-set remains more or less constant at 13% from marginal to medium farmers but goes up to about 18% in the case of large farmers. However, in the case of diesel pump-sets, the share of expenditure on diesel oil is very high (about 47%) for marginal farmers and goes down to about 30% in the case of medium farmers. The number of observations relating to the use of diesel pump-sets in large farmers category was not sufficient to compute a meaningful cost estimate.

The average utilization factor of an electric pump-set is estimated to be higher (10.4%), than that of a diesel pump-set (3%) (Table 4.13). Moreover, the average capacity utilization factor of electric pump-sets increases with size of the land-holding. However, no clear relationship between the capacity utilization factor of diesel pump-set and the size of land-holding is noticed, perhaps because of the limited number of observations.

As only 21 farmers reported the cost figures for diesel pump-sets, it is not meaningful to produce any statistical estimate of the CUE using this method. Knowing this limitation, we have estimated the average cost of using diesel for pumping with a limited data set and that cost works out to be significantly higher than that of using electricity (Table 4.15).

Table 4.15 Cost comparison of electric and diesel pump sets in Karnataka (at 1999 prices)

Description	Marginal (< 1 ha)	Small (1-2 ha)	Small-medium (2-4 ha)	Medium (4-10 ha)	Large (> 10 ha)	Total/ Average
Electrical pump-set						
No. of valid cases	122	219	195	113	47	696
Capital cost (Rs/KW)	8756	8897	8043	8891	9093	8654
	(76)[a]	(85)	(78)	(62)	(94)	(79)
Annual total cost per pump-set (Rs)	8503	11385	11730	13745	14485	11703
	(64)	(67)	(54)	(59)	(58)	(63)
Capital cost (%)	63.18	59.51	56.29	58.16	57.16	58.50
Electricity cost (%)	14.04	12.64	13.19	13.60	18.00	13 77
Maintenance cost (%)	22.78	27.85	30.52	28.25	24.84	27 73
Annual output (in kWh equivalent) (kWh)	3365	3978	5200	5753	8126	4905
	(123)	(90)	(90)	(80)	(96)	(99)
Average cost (electricity only)[b] (Rs/kWh)	0.29	0.30	0.25	0.25	0.26	0.27
Average cost (electricity + maintenance only)[b] (Rs/kWh)	0.71	0.85	0.80	0.77	0.69	0.78
Average cost (electricity + maintenance + capital)[b] (Rs/kWh)	2.14	2.31	1.90	1.93	1 61	1 99
Diesel pump-set						
No. of valid cases	4	6	8	3	na	21
Capital cost (Rs/KW)	3854 (56)	4905 (95)	5556 (68)	2878 (51)	na	4496 (77)
Annual total cost per pump set (Rs)	10441	10563	12574	9425	na	12481
	(84)	(68)	(56)	(69)		(76)
Average capital cost (%)	30.19	41.05	40.69	49.45	na	40 21
Average diesel cost (%)	47.47	43.19	43.93	30.39	na	40 37
Average maintenance cost (%)	22.35	15.76	15.38	20.16	na	19 42
Annual output (in kWh equivalent) (kWh)	1719	1273	1996	1416	na	3661
	(171)	(58)	(81)	(172)		(226)
Average cost (diesel only)[b] (Rs/kWh)	6.67	5.41	3.26	5.27	na	4 27
Average cost (diesel + maintenance only)[b] (Rs/kWh)	11.13	6.73	4.43	9.91	na	5 79
Average cost (diesel + maintenance + Capital)[b] (Rs/kWh)	15.82	11.59	7.37	14 10	na	9 56

[a] Figures within parentheses are coefficient of variation
[b] Estimated values are 5% trimmed mean

4.10 Cost of unserved energy using WTP assessment: Method 3

We now turn to the WTP estimates derived from the survey of 908 farmers in Karnataka and 910 farmers in Haryana. A detailed description of current land ownership, irrigation, crop production, and the energy supply situation has been given in Sections 4.1 to 4.7. These provide the essential background and context for the WTP results reported in this section.

Respondents were presented with slightly different scenarios depending on whether they already used electricity (for agriculture) used only diesel pump-sets or had no pump sets at all.

The scenario presented to the existing electricity consumers was as follows. "As you are aware, farmers in the state face problems of power supply. Looking to the future, it is possible to fix the problems of power cuts and poor quality grid supply. This will require significant new investment in generation, transmission and distribution. An improved electricity supply for irrigation is likely to increase crop production and the lifetime of pump-sets. As you may agree, an extra supply of power each day would be able to meet your irrigation requirements. In order to increase the hours of electricity supply and to make the supply reliable and stable, new investments is essential. This investment is expensive and the cost would have to be recovered through the electricity tariff."

They were then told:
"We do not yet know exactly how much this investment would cost but I would like to know, if the grid supply was improved, would you be willing to pay more for a reliable power supply to pump-sets?

Those who agreed to this in principle were then presented with the bidding game in terms of monthly (Haryana) or yearly (Karnataka) payments per hp of pump capacity. Initially payment options were expressed in terms of Rs per month and Rs/kWh. These are theoretically more attractive as responses are not necessarily tied ('anchored') to the existing payment level. Unfortunately, the majority of farmers – who have no experience of paying for electricity in this way – were unable to calculate how much they would pay using these alternative methods.

4.10.1 WTP for agriculture in Haryana

Excluding the 6% of respondents who did not to believe the scenario, only *15% were found to be willing to pay* more than the existing levels per hp for improved supply (7% of those currently without electricity, 19% of those with electric pump-sets, 20% of those with diesel pump-sets, and 14% of those with both).

The much lower proportion of the sample that is willing *in principle* to pay more for improved supply in Haryana (15% as opposed to 58% in Karnataka)

reflects the much higher annual tariff per hp – Rs 600 or Rs 50 a month – approximately twice the level in Karnataka.

For the small group of those willing to pay more per hp, the average additional payment was Rs 26/hp/month. This additional amount is about half the current tariff (the same proportionate increase as found in Karnataka but twice the level in terms of cash payment per year).

Farmers in Haryana currently report an average of 750 hours of irrigation per year. Their responses to the survey indicate that they require an average of nearly 970 additional hours per year for irrigation. For the 15% with positive WTP, the estimated requirement is approximately 1100 hours per year. *Once this additional hours of electricity requirement is taken into account only 14% of those willing to pay more per hp for improved supply are actually willing to do so' per kWh.* By calculating the current consumption and the consumption associated with improved supply, only 2% of the farmers in Haryana are willing to pay more than what they currently pay per unit for improved supply.

As the sample size of this group is less than 20, it is not possible to produce any meaningful statistical estimate of the CUE using this method. Nonetheless, the survey results can be used to derive average figures for the 'ability to pay' – the amount per kWh currently spent on electricity – either weighted by electricity used (for analysis at the consumer group level) or un-weighted (for the individual farmer's perspective). This is shown by size of the landholding, in Table 4.16.

Table 4.16 Ability to pay weighted and un-weighted costs

Current cost (Rs/kWh)	Marginal (< 1 ha)	Small (1-2 ha)	Small - medium (2-4 ha)	Medium (4-10 ha)	Large (>10 ha)	Total/ Average
Weighted	1 61	1.51	1.10	0.90	1.77	1 29
Unweighted	3.98	2.74	1.89	1 38	1.15	2 18

Two conclusions can be drawn from this analysis.

- Marginal and small farmers typically pay far more per kWh than larger farmers. Those in the 'large'-farmer category pay more per kWh mainly because they frequently own multiple pump-sets and each is used less intensively than any of those on smaller farms.
- There is a strong argument in favour of introducing metering, as farmers in Haryana already pay a significant *but implicit* per unit charge. A simple metered unit charge would leave small farmers paying far less per unit than they currently do.

4.10.2 WTP for agriculture in Karnataka

Debriefing questions showed that 5% of the respondents rejected the scenario and did not answer the WTP question for that reason. Excluding this group, *58% of all the farmers were willing to pay more per hp for improved supply.* Of this group, those who currently rely on electric pump-sets (the overwhelming majority), two-thirds were willing to pay more per hp. No diesel users were willing to pay more than what they pay now.

Those who were willing to pay more per hp indicated that they would pay a mean additional amount of 157 Rs/hp per year (approximately half as much again as the current tariff).

Respondents currently use electric pump-sets for approximately 1000 hours each year (for all the three cropping seasons together) (Table 4.8). As part of the WTP survey, they were asked how many additional hours they would require for irrigation in each season. On average, the figure is 1320 hours per year. However, for the 58% with positive WTP the additional requirement is 1900 hours per year. *Once this additional hours of electricity requirement is taken into account only 5% of those willing to pay more per hp for improved supply are actually willing to do so' per kWh than what they pay now.* By calculating the current consumption and the consumption associated with improved supply, only 3% of the farmers in Karnataka are willing to pay more than what they currently pay per unit for improved supply.

Given the very small sample size (23 observations) of those willing to pay more per unit for improved supply, it is not possible to estimate a marginal CUE for farmers in Karnataka using the CVM approach. It is also not possible to use regression analysis to explain the WTP bid level (as the sample size available is too small).

Although the CVM approach could not estimate a marginal CUE for farmers in Karnataka, it has produced two results that will be useful for policy-makers. These are:

- A clear majority of farmers is willing to spend more money each year on electricity if they receive an improved supply.
- They are willing to spend up to 50% more for improved supply if charged, as now, in hp terms. However, the percentage increase in hours required for irrigation is even more than this.

The survey data allow us to calculate what current payments are in kWh terms for electricity. This gives us an indication of the 'ability to pay' rather than the 'willingness to pay'. These estimates of ability to pay (weighted by energy consumed) by the size of land-holding is given are Table 4.17. Current tariff rates for farmers in Karnataka do translate into very low unit costs for irrigation but these discriminate against marginal and small farmers in favour of larger land-holders.

Table 4.17 Ability to pay weighted by energy consumed

Cost	Marginal (< 1 ha)	Small (1-2 ha)	Small - medium (2-4 ha)	Medium (4-10 ha)	Large (>10 ha)	Total/ Average
Current cost (Rs/kWh)	0.29	0.30	0.25	0.25	0.26	0.27

4.11 The most likely estimate of the cost of unserved energy

The cost of alternative generation method should provide the most likely estimate of CUE. In case of agriculture this would be the cost of using diesel pump-sets. This estimate is applicable for Haryana but not for Karnataka. The method is not applicable for Karnataka as the depth of water table is very low in Karnataka and almost all farmers rely only on electric pump-sets. As a result, the cost of using diesel pump-sets does not provides a statistically significant result for estimating CUE in Karnataka due to the limited number of cases.

Similar in case of the WTP method, an insignificant percentage of farmers agreed to pay more than the current tariff per kWh as was discussed in the earlier section. Therefore a statistically significant estimate of CUE using the WTP method is not possible in the two states. In view of this, it appears that the net production loss due to outage provides the most likely range of CUE values for Karnataka and the cost of using diesel pump-sets provides the most realistic

estimate of CUE in Haryana. The CUE estimate in agriculture sector using these methods is Rs 3.84 per kWh in Haryana and Rs 3.21 per kWh in Karnataka.

4.12 Estimation of state-level economic losses

An attempt is made to estimate the economic loss in the two states due to power outages for irrigation. This is done by multiplying the CUE values obtained by the net production loss due to power outage (Method 1) in both the states with the extra hours of power demand for irrigation due to power cuts. The value thus obtained is expressed as a percentage of agriculture SDP of the state to ascertain the economic loss due to unserved power at the state level.

Before proceeding with this calculation it is necessary to estimate the state level CUE by production loss for the agriculture sector. This value is computed by weighting the CUE estimates for different categories of farmers with the true population distribution of farmers in the corresponding category. The corresponding CUE estimate at the state level is thus Rs 1.29 per kWh for Haryana and Rs 3.64 per kWh for Karnataka.

The economic loss for the two states is estimated in Table 4.18. The estimated loss expressed as percentage of agriculture SDP of the state is 3.1 percent in Haryana and 14.8 percent in Karnataka.

Table 4.18 Economic loss to the states in 1998/99 (million rupees)

State	Add. power demand (million kWh) (1)	CUE by production loss (Rs per kWh) (2)	Economic Loss (3) = 1 x 2	Agriculture SDP 1998/99* (4)	Loss as percentage of agriculture SDP (5) = 3/4*100
Haryana	3 940	1.29	5 094	165 155	3.1
Karnataka	9 288	3.64	33 834	229 122	14.8

* SDP estimated from 1980/81 - 1996/97 timeseries of agriculture SDP given for the two states in EPW Research Foundation (1998), National Accounts Statistics 1950/51 - 1996/97, Mumbai October 1998

5 Conclusions

Three methods have been used to estimate the cost of unserved energy (CUE) for industrial and agricultural consumers in Haryana and Karnataka, namely

- value of production loss for each unit of power outage (production loss method)
- cost of alternative or back-up power generation (captive generation method)
- willingness to pay (WTP) for reliable and uninterrupted electricity supply (WTP method).

The alternative methods employed in this study provide useful inputs in addressing the question of the extent of tariff revision for industrial and agricultural consumers in the two states of India— Haryana and Karnataka.

The production loss method gives the maximum level that a consumer can pay. This can be interpreted as the upper bound on electricity tariffs. However, this method suffers from certain limitations as this estimate is based on the recall ability of the respondent. Often the value of loss may be overstated as the entire loss in production is attributed to the power cut. Under normal circumstances, the estimated price or value of electricity may make production non-viable. In an ex-ante analysis, power shortage is valued at the loss in fixed costs whereas in an ex-post consideration all losses are assigned to the power cut, especially if it is an unscheduled one. Despite these limitations, the production loss method provides an estimate of the upper limit on the price for electricity.

The CUE estimates by this method show a difference of more than a factor of four for the industrial sector in the two states. One of the main reasons for this is the composition of output and the extent of value addition that takes place in the industrial sector. Amongst the two states, Karnataka is relatively more industrialized with a sizable investment in information technology, cement, steel, aluminium, engineering and other industries. Although industrialization of Haryana is proceeding at a fast pace, there is still a lack of penetration of hi-tech and high value addition industries such as software, engineering, steel, etc. As a result the ratio of industrial value-added to the industrial value of output in Haryana is 0.14 which is significantly below Karnataka 0.22 (1993/94 data from

CMIE: Profile of States, March 1997). Observing the industrial growth trend in the two states over the past several years, it is felt that these ratios are further diverging from each other. Bangalore in Karnataka, has emerged as the software and info-tech city of India, and a large percentage of investment in software and information technology sectors is being directed to this state. As a result the high CUE estimates by production loss method for industrial sector in Karnataka confirm that industry is more productive in Karnataka and, therefore, has significantly higher value addition per unit of output.

The second method adopted in this study, the cost of alternative or captive generation estimates indirectly the tariff a consumer will pay for electricity. The assumption is that if the consumer is willing to undertake self-generation, he or she would be willing to pay at least the cost of self-generation as the price for grid power. Again there are limitations in this approach. On the one hand, this approach may be an overestimate in that the consumer may be willing to pay the estimated price for a fraction of the units (those generated during the power cut) but not for all the electricity units required in the production process. On the other hand, the price may be under estimated in this approach as there are some costs that cannot be monetized, for example, the additional investment required, the inconvenience due to the hot air and noise from the generator, and the additional responsibility of maintaining the generator. Despite these limitations, the captive generation method does provide a lower bound on the tariff a consumer is willing to pay at the margin. In our study, we find that in industry the consumers have a higher cost of captive generation than the cost of grid supply in Haryana. In Karnataka, the cost of captive generation is lower than the cost of grid supply. Despite a liberal captive policy[1] in the two states and under utilized captive capacity, there is a greater degree of reliance on grid supply when less expensive captive generation is possible. Also, it is interesting to note that the willingness to pay is higher than the cost of captive generation. These results indicate that the perception and mindset of industrial consumers about costs are very different than the actual costs of alternative sources.

The consumer is willing to pay somewhere between the upper bound (production loss method) and the lower bound (cost of alternative generation). The WTP approach (the third method) measures the price that the consumer is

[1] Haryana and Karnataka have a liberal captive policy. Both the states allow wheeling and banking of power (although with slightly different conditions), third party power sales, and sales to the state utility. Further, in Haryana, joint commissioning and operation of a captive power plant by two or more industrial partners is allowed. (The Captive Report, 1998, Powerline Research)

willing to pay. There are limitations with this approach as well. The approach is highly dependent on questionnaire design and respondents understanding of the hypothetical scenarios. In agriculture sector this difficulty was faced as most of the farmers were unused to kWh billing. As a result the questionnaire had to be designed for capacity (hp) based tariffs. Responses received from the respondents showed that while a significant number of farmers are willing to pay higher on a per hp basis, the same did not hold true on per kWh basis. As the additional hours of power demand were factored into the analysis with the bid levels, only an insignificant number of farmers were found willing to pay higher on a kWh basis. As a result no statistically significant conclusions could be drawn in agriculture sector through this method. The WTP method depends on several critical assumptions. However, it helps to narrow the range between the upper and lower limits on electricity tariffs and provides insights for a more practical policy for electricity tariffs.

Policy implications

The research and analysis undertaken in this study provides useful insights that can provide inputs in designing effective policies for the power sector.

- The electricity markets in the two states are complex and there is no single approach that can be used to arrive at electricity tariffs that different segments of the market will accept.
- The use of the contingent valuation method (WTP) can be used to estimate the CUE for the industrial sector. The study has shown that a significant proportion of industrial consumers in both Haryana and Karnataka are not only willing to pay more for improved power supply, but also that they would prefer this to be delivered by the private sector. The industrial sector in Haryana is willing to pay over 40 percent more than current tariffs; for Karnataka, the figure is 13.5 percent.
- The study has identified (or reconfirmed) the factors that must be addressed if consumers are to be persuaded to pay higher tariffs. These include factors related to the organisation of the power sector (for example the need to address the issue of 'unofficial' payments made to utility's staff) and factors related to the quality of electricity supply. The key here is to give consumers good information so that they can plan accordingly. Thus the study found an urgent need to address unscheduled outages, followed by scheduled outages and voltage fluctuations.
- Generalisations for a customer group should not be made for India as a whole. For example, in Karnataka a clear majority of farmers are willing to

spend more each year if they receive an improved supply (this needs to be tested against tariffs set at cost-recovery levels). They are willing to spend up to 50 percent more for improved supply if charged, as now, in per hp terms. However, in Haryana, only around 15 percent of farmers are willing to pay for such improved supply on a hp basis. The main reason for this could be that the tariff in Haryana is nearly double of that in Karnataka.

- The WTP method does not provide useful results in the agricultural sector. In both the states the farmers are willing to pay more in hp terms. This combined with the demand for increased usage, does not indicate a willingness to pay more in terms of rupees per kWh. Charging agricultural users on the basis of hp does not provide the right incentives for rational consumption of power. In a reformed power system, consideration should be given to switching to metered consumption. This will reflect the correct and the actual price paid by the consumers' (e.g., calculated imputed tariffs are quite substantial in Haryana), induce a rational consumption behaviour and also assist in improving the supply of power. Thus there is an immediate need to change the mindset of consumers with respect to electricity tariffs.
- An important policy indicator that emerges from this study is that it is necessary to focus on both the demand and the supply side. On the demand side, especially, for the agricultural consumers, a change in the mindset and perception of consumers is required in terms of not treating electricity as a subsidised resource. Farmers in Haryana are obviously paying a significantly higher (implicit) tariff than is widely perceived. And, paradoxically, it is the small and marginal farmers who are paying a higher (implicit) tariff for poorer service. These facts should be brought to the attention of both the politicians and the farmers in the state, which could provide the platform for introducing a metered tariff system. In Karnataka, while the implicit tariff is very low, other limitations on the choice of technology need to be recognised. Strategically, the point needs to be made that for every unit the utility is unable to supply, the farmers are losing about 2 to 4.3 rupees in profits.

ANNEX 1

QUESTIONNAIRES

A1.1 Industrial Schedule

Reference No. (*to be filled by TERI*) ______

GENERAL INFORMATION

1 Name of company ____________________

2 Main interviewee's name. ____________________

3 Designation: ____________________

4 Address ____________________

4 1 District ____ 4 2 Pin ____ 4 3 Telephone number ____ 4 4 Fax ____ 4 5 Email ____

5 Main Product ________ 6 Specify 2-digit NIC (refer sheet No 1) ____________

7 What is the account number(s) of your electricity meter(s)? 7 1 ____________

7 2 ________ 7 3 ________ 7 4 ________ 7 5 ________

8 Monthly and/or annual sales and electricity consumption for April 97 – March 98

Month		Value of total sales (Rs)	Electricity Purchased(kWh)	Electricity Generated (kWh)
		1	2	3
April 1997	1			
May 1997	2			
June 1997	3			
July 1997	4			
August 1997	5			
September 1997	6			
October 1997	7			
November 1997	8			
December 1997	9			
January 1998	10			
February 1998	11			
March 1998	12			
Total for year 97/98	13			

9. Please provide a copy of your last year's annual report :

9.1☐ Yes 9.2 ☐ No

10. Total Expenditure on electricity last year(April 97 – March 98):

10.1 Purchased: Rs_______ 10.2 Self-generated: Rs ___________

11. Total cost of Production last year (April 97 – March 98): Rs ______________

11.1 What % of total cost you spent on electricity last year? _________

11.2 INTERVIEWER TO COMPLETE:

$$\frac{\text{Total expenditure on electricity last year Rs (from 10.1)}}{\text{Total electricity purchased last year kWh (from 8.13, 2)}} =$$

INTERVIEWER YOU WILL NEED TO USE THIS CALCULATION AT QUESTION 27

Details		No. of Captive unit						
		1	2	3	4	5	6	7
Year installed	1							
Expected life of asset (years)	2							
Total asset life for accounting purposes (years)	3							
Installed capacity (kW/kVA)	4							
Type of captive unit (steam/diesel-set)	5							
Average number of hours run in a day	6							
Average number of times run in a day	7							
Average daily loading (%) *	8							
Total capital cost including Installation cost (Rs)	9							
Total expenditure on fuel (Rs/month)	10							
Type of fuel used	10 1							
Maintenance & tuning cost (Rs/month)	11							
Average units generated per day (kWh)	12							
Total cost of generation (RS/kWh) from company	13							

Note: *Average daily loading means on an average the total number of hours the unit is run in a day out of 24 hours

GRID POWER

13 What is your sanctioned load/contracted demand from the SEB? 13 1 kW______ 13 2 kVA______

14 What has been your average power factor for last year (April 97- March 98)?____

15 Do you have any problems with the supply of electricity you receive from the SEB?

15 1 ❑ Yes 15 2 ❑ No

If YES, ask 16 otherwise go to Section D.

16 What are the problems you experience with the electricity supply from the SEB?

Interviewer to code response in Table as indicated below – Please score each problem from 1 to 5 (1 is very mild problem, and 5 is very serious problem)

Code	Problem of supply	Score
01	Voltage fluctuation	
02	Frequency fluctuation	
03	Scheduled outages (power cut)	
04	Unscheduled outages (power cut)	
05	Demand cut/ Peak load cut	
06	There is no response to complaints	
07	Unofficial payments are required for repairs	
08	Getting a new connection from the grid is very difficult	
09	Getting additional load from the grid is very difficult	
10	Other (specify)	

17 What is the duration of one production cycle of your main product? ____hrs

18 Please note number of hours in standard working day ____________hrs

Read out the definitions of different types of power cuts as given in the instruction manual

19 How many *hours* of demand outages (power cut) do you face *on average* during a production *day*?

19 1 Summer (Duration)______hrs 19 2 Winter (Duration) ________hrs

20 How many *hours* of unscheduled outages (power cut) do you face *on average* during a production *day*?

20 1 Summer (Duration)______hrs 20.2 Winter (Duration) ________hrs

21 How many *hours* of scheduled outages (power cut) do you face *on average* during *a production day*?

21 1 Summer (Duration)______hrs 21.2 Winter (Duration) ________hrs

22 How many *hours* of outages (power cut) do you face *on average* during *a production day*?

22.1 Summer (Duration)______hrs 22.2 Winter (Duration) ________hrs

23 Is your production process affected by fluctuations in voltage and/or frequency, or interruptions to supply?

23.1 ❑ Yes 23.2 ❑ No

IF YES, please state the production loss in terms of percentage of value lost or/and in terms of Rupees or units lost due to power failure.

	Production loss:		
23.3	No of units (average)		Units ___________
23.4	% of average monthly production		XXXXXXXXXXXXX
23.5	Rupees		XXXXXXXXXXXXX

WILLINGNESS TO PAY

Scenario Description (INTERVIEWER TO READ OUT)

"As you are aware, businesses in this state face problems of power supply. Some companies make do with their grid supply while other rely partly or wholly on captive generation. As things stand, you pay a certain amount for grid supply as well as paying for any damage due to voltage fluctuations and interruptions to supply. You may also pay for stand-by or captive generation – which can be far more expensive per kWh than grid supply.

An improved electricity supply may increase your company's productivity. However, clearly if output is to be increased you will incur costs besides the cost of electricity. Looking to the future it is possible to fix the problems of restricted and poor quality grid supply. In order to do this it will require significant new investment in generation, transmission and distribution. This new investment is expensive and the cost would have to be recovered through the electricity tariff.

24 We do not yet know exactly how much this investment would cost but I would like to know, if you agree in principle with paying for an improved grid supply?

24.1 ❑ Yes 24.2 ❑ No IF NO, GO TO QUESTION 29

BIDDING GAME

25 Now I am going to read you some costs per kWh that a stable and uninterrupted electricity supply might cost you. There would not be any other charge for supply Please tell me if you would be willing to pay this amount for the improved service Please do not agree to pay if your company cannot afford it or if you feel there are other things that are more important for you to spend money on

Rs/kWh	[✓ or x]
8 00	
2 50	
7.00	
3 00	
6.00	
3.50	
5.50	
4 00	
5 00	
4 50	

26 Do you have any preference for the power supplier?

26 1 ❑ SEB 26.2❑ Private Agency 26.3❑ Any other (specify) 26 4❑ Indifferent

INTERVIEWER IS THE ANSWER TO 11 2 (i e current tariff) EQUAL TO OR HIGHER THAN THE HIGHEST NUMBER TICKED IN QUESTION 25?

27 1 ❑ YES 27.2 ❑ NO IF YES CONTINUE ELSE GO TO QUESTION 30.

READ OUT "From the figures you have given us it appear s that you are currently paying [from 11 2] per kWh for grid supply You have also said that you are not willing to pay more than this for the improved electricity supply we have described Is this really the case or would you like to revise the amount you say you would be willing to pay for improved supply?"

28 1 ❑ No change 28 2 ❑ Revise bid. IF NO CHANGE GO TO 29 IF REVISE BID ASK.

So what is the maximum you are willing to pay per kWh for a stable and uninterrupted electricity supply? Rs/kWh_______

IF 28 3 COMPLETED GO TO 30

29. Please could you give the reasons why you are not willing to pay more for the improved electricity supply?

Interviewer to code various reasons.

Code	Mark a tick	Reason
01		Cannot afford to pay (threat of bankruptcy)
02		Do not believe we would get improved supply
03		Demand is already met from self-generation
04		Can meet additional demand from self generation at lower cost
05		Believes the current tariff is already above the cost of grid supply to industry
06		Believes the current tariff is above the industrial tariff in other States
07		Other (please specify)

30. Which of the following statements *best* describes the way you felt when we described the option of an improved supply to you: [TICK ONE ONLY]

1. "the introduction of new investment in to the electricity sector in this State has a good chance of improving the electricity supply"

2. "this new investment may improve the electricity supply but it will take so long to produce benefits it is not worth much to me"

3. I just did not believe that this system for improved supply you described could be introduced or made to work in our State"

Interviewer's Name: ____________________ Date: ______________

From MRA- Scrutiny by: ___________ BC by. ______________

From TERI- Checked by: ______________ Date: ______________

A1.2 Village Schedule

Reference No. (to be filled by TERI) ______

GENERAL INFORMATION

1. Village respondent's name:_________________ 2.Name of the Patwari: ___________

3.1 Village: ______________ 3.2. Block:_____________3.3. Taluka: _______________

3.4 District: ______________ 4. Agro-climatic zonal code (*pl. show the map*): ___________

5. Distance from the nearest town (km):_____ 6. Name of the town : ________________

7. Number of households in the village: ____________ 8.Total population: ___________

9. Distance from main road (km): ______________

10. Percentage of the total households electrified? ____________

11.1Groundwater depth: Summer: _____ Feet 11.2 Winter: ______Feet

12. Household Distribution

No.	Type	Land area owned	Number of households	
			From the Patwari	From the Sarpanch
12.1	Large farmers	> 10 ha or > 25 acres		
12.2	Medium farmers	4 - 10 ha or 10 – 25 acres		
12.3	Semi-medium farmers	2 - 4 ha or 5 – 10 acres		
12.4	Small farmers	1 - 2 ha or 2.5 – 5 acres		
21.5	Marginal farmers	< 1 ha or <2.5 acres		
12.6	Landless households			

LAND DISTRIBUTION

13. AREA

13.1 Total village ________ha / acres 13.2 Net Cultivated: ________ ha / acres

13.3 Net irrigated: ________ha/ acres

14 CROPS GROWN

Rabi season: 14.1 From ____________ 14.2 To ________________

14.3 Major crops ______________________________ ______________________

14.4 Minor crops ____

Kharif season: 14.5 From ____________ 14.6 To __________________

14.7 Major crops ________________________ ____________________________

14.8 Minor crops ____

Summer season: 14.9 From ____________ 14.10 To __________________

14.11 Major crops ________________________ ______________________

14.12 Minor crops ____

RAINFALL AND IRRIGATION

15.1 Monsoon period (months) From: ___________ To: ______________

15.2 Sources of irrigation: canal / borewell / openwell/ ponds (in order of usage):

____

15.3 Is their any buying of water for irrigation? Yes / No

15.4 If yes, what percentage of total households buy water for irrigation?____________

15.5 Total number of diesel pumpsets _________________

15.6 Average capacity of diesel pumpsets (HP): _______________

15.6.1 Minimum _________ 15.6.2 Maximum _________

15.7 Total number of electric pumpsets ____________________

15.8 Average capacity of electric pumpsets (HP) : ______________

15.8.1 Minimum _________ 15.8.2 Maximum _________

Interviewer's Name: ____

Date:

Checked by TERI: ______________________________ 1☐ Yes 2☐ No

Date:

A1.3 Agricultural Schedule

Reference No. (*to be filled by TERI*) ________

GENERAL INFORMATION

1. Name of the chief wage earner : ____________________

2. Village: __________ 3. District __________ 4. Family size: ______

5.1 Primary occupation: ________ 5.2 Secondary occupation: ________

6. Type of house (Kutchha/ Pucca/Mixed): ______________

EXPENDITURE

7. What is your average <u>monthly</u> household expenditure? Rs________

7.1 Domestic

7.1.1 Food & milk: Rs________ 7.1.2 Electricity-domestic Rs. ______

7.1.3 Kerosene Rs______ 7.1.4. LPG Rs ________

7.1.5 Water - domestic: Rs _____ 7.1.6 Education: Rs ________

7.1.7. Transport: Rs _______

7.2 Agriculture (annual)

7.2.1 Electricity-agriculture Rs _______ 7.2.2 Diesel Rs ______

7.2.3 Water – agriculture: Rs ________ 7.2.4 Transport: Rs ________

7.2.5 Expenditure on other agricultural inputs (seeds, fertilisers and pesticides, etc.) Rs/year______

AGRICULTURE SECTOR

LAND USE AND CROPPING PATTERN

(Please insert unit of measurement)

Total land for cultivation: 8.1 Own ________ 8.2 Tenancy ________

Net irrigated land: 8.1.1 Own ________ 8.2.1 Tenancy ________

Gross irrigated land: 8.1.2. Own ________ 8.2.2 Tenancy ________

9. Crops Grown (*Insert unit of measurement for area and total production)*

Season		Crops	Area under each crop	Area under irrigation	Total production	Proportion sold to the market (%)	Local Selling price Rs
		1	2	3	4	5	6
Rabi	1						
	2						
	3						
	4						
Kharif	5						
	6						
	7						
	8						
Summer	9						
	10						
	11						
	12						
All year	13						
	14						

9.1 Local unit for production: ____ 9.2 Conversion norm from local to standard unit: ________

9.3 Local unit for area: ________ 9.4 Conversion norm from local to standard unit: _________

10. Sources of irrigation for the fields

	Sources of irrigation	Number
10.1	Own borewell	
10.2	Other farmers borewell	
10.3	Own open well	
10.4	Other farmers open well	
10.5	Water from canal (YES/ NO)	
10.6	Others (specify)	

PUMPSETS

11.1 Do you own a pumpset? a☐ Yes b☐ No

11.2 Do you share a pumpset with another farmer? a☐ Yes b☐ No

IF YES, please provide answers only for your share in question 12

IF NO, go to question 16.

12. Particulars of electric and diesel pumpset(s)

Details		1	2	3	4
Type of pumpset (specify codes)*	1				
Year of installation	2				
Capacity (hp)	3				
Capital cost including installation during the year of installation (Rs)	4				
Average number of hours run in Rabi season	5				
Average number of hours run in Kharif season	6				
Average number of hours run in Summer season	7				
Name of fuel used (Diesel/Petrol/ Kerosene/ Electricity)	8				
Total fuel expenditure – Rabi (Rs)	10				
Total fuel expenditure – Kharif (Rs)	11				
Total fuel expenditure – Summer(Rs)	12				
Annual expenditure on maintenance and engine tuning	13				
For Diesel/Petrol/Kerosene pumpsets only					
How much fuel is filled at one time? (write in units)	14				
How long does pumpset run on one filling of fuel	15				

*Please specify codes : Centrifugal pumpset (1) / Submersible pumpset (2)

13. How do you pay for electricity for agriculture?

13.1 ☐ Flat tariff/ un-metered 13.2 ☐ Meter

IF 13.1 go to 14, otherwise go to 13.3

13.3 Does this meter work? a ☐ Yes b ☐ No

14. How much did you pay for electricity for agriculture last year?

______Rs for ______ months

BUYING or SELLING OF WATER

15. Do you sell water (for money or barter) to other farms/farmers?

15.1 ☐ Yes 15.2 ☐ No

If yes, go to 15.3, if no go to 16

15.3 What was your net annual income from selling water last year? Rs_________

16. Do you buy water (using money or barter) from other farmers?

16.1 ☐ Yes 16.2 ☐ No

If yes, go to 16.3, if no go to 17

16.3 What was your total expenditure in buying water last year? Rs _________

HIRING/RENTING OF PUMPSETS

17. Do you give pump set on rent to other farms/farmers?

17.1 ☐ Yes 17.2 ☐ No

If yes, go to 17.3, if no, go to 18

17.3 What was your total annual income from renting out pumpset(s) last year? Rs___

18. Do you hire pumpset from other farmers?

18.1 ☐ Yes 18.2 ☐ No

If yes, go to 18.3, if no go to 19

18.3 What was your total expenditure in hiring pumpset last year? Rs_________

ELECTRICITY

19. Do you have any problems with the supply of electricity you receive from the SEB?

a.❑ Yes b ❑ No

IF YES, ask 20 otherwise go to Section D.

20. What are the problems you experience with the electricity supply from the SEB?

Interviewer to code response in Table as indicated below – Please score each problem from 1 to 5 (1 is very mild problem, and 5 is very serious problem)

Code	Problem of supply	Score
01	Voltage fluctuation	
02	Frequency fluctuation	
03	Scheduled outages (power cut)	
04	Unscheduled outages (power cut)	
05	Demand cut	
06	There is no response to complaints	
07	Unofficial payments are required for repairs	
08	Getting a new connection from the grid is very difficult	
09	Other (specify)	

21. Availability of electricity

Details		1	2	3	4
		Kharif	Rabi	Summer	All year
Time of day of supply M, A, E, N					
Average number of hours electricity available for irrigation/day					
Extra number of hours electricity needed for meeting for irrigation requirements/day					
When this should be available? M,A,E,N					
Expected increase in yield if extra irrigation is available	Crop 1				
	Crop 2				
	Crop 3				
	Crop 4				
	Crop 5				

NOTE PERIOD OF SUPPLY CAN BE MORE THAN ONE, for example M, A, E, N

D. Scenario Description – Agricultural consumers

PLEASE READ SECTION D1 FOR THOSE WITH ELECTRIC PUMPSETS, AND FOR THOSE WITH DIESEL PUMPSETS OR WITHOUT PUMPSETS READ SECTION D2

D1. "As you are aware, farmers in the State face problems of power supply. Looking to the future it is possible to fix the problems of power cuts and poor quality grid supply. This will require significant new investment in generation, transmission and distribution. An improved electricity supply for irrigation is likely to increase crop production and the lifetime of pumpsets. As you may agree that an extra supply of power each day would be able to meet your total irrigation requirements. In order to increase the hours of electricity supply and to make the supply reliable and stable new investments have to be carried out. This investment is expensive and the cost would have to be recovered through the electricity tariff."

D2. "If you get connected to the electricity grid you could buy an electric pumpset and use this to irrigate your fields. It costs less to run an electric pumpset than a diesel pumpset. However, as you are aware, farmers in this State sometimes face problems of power supply. Looking to the future it is possible to fix the problems of restricted and poor quality grid supply. This will require significant new investment in generation, transmission and distribution. If you had access to an improved electricity supply for irrigation, it is likely to increase your crop production and the lifetime of your pumpsets. In order to increase the hours of electricity supply and to make the supply reliable and stable new investments have to be carried out. This investment is expensive and the cost would have to be recovered through the electricity tariff."

22. We do not yet know exactly how much this investment would cost but I would like to know if the grid supply was improved would you be willing to pay more for the reliable power supply to pumpsets?

a ☐ YES b ☐ NO IF NO, GO TO QUESTION 25

23. BIDDING GAME FOR HARYANA FARMERS

Now I am going to read you some costs per month that an improved electricity supply might cost you. There would not be any other charges for supply. Please tell me if you would be willing to pay this amount for the improved service. Please do not agree to pay if you cannot afford it or if you feel there are other things that are more important for you to spend money on.

Rs per hp per month	HP= Monthly costs	[✓ or x]
200		
55		
180		
60		
150		
65		
125		
70		
110		
75		
100		
80		
95		
85		

You have just told us how much you would pay for an improved electricity supply to pumpsets. Can you now tell us how many hours of irrigation you would expect to use this supply for on average in each season?

	Rabi	Kharif	Summer
Total hours			

23. BIDDING GAME FOR KARNATAKA FARMERS

Now I am going to read you some costs per month that an improved electricity supply might cost you. There would not be any other charges for supply. Please tell me if you would be willing to pay this amount for the improved service. Please do not agree to pay if you cannot afford it or if you feel there are other things that are more important for you to spend money on.

Would use up to 10 hp			Would use more than 10 hp		
Rs per hp per year	HP= Yearly costs	[✓ or X]	Rs per hp per year	HP= Yearly costs	[✓ or X]
1500			2500		
150			400		
1300			2200		
200			500		
1000			2000		
225			525		
800			1700		
250			550		
700			1500		
275			600		
600			1300		
300			650		
550			1100		
320			700		
500			1000		
350			750		
450			900		
375			800		
425			875		
400			850		

You have just told us how much you would pay for an improved electricity supply to pumpsets. Can you now tell us how many hours of irrigation you would expect to use this supply for on average in each season?

	Rabi	Kharif	Summer
Total hours			

PLEASE DO NOT ASK Q. 25 IF THE RESPONDENT HAS PLAYED THE BIDDING GAME AND AGREED TO PAY MORE THAN THE CURRENT CHARGES FOR ELECTRICITY SUPPLY

25. "Why are you not willing to get electric pumpset or pay for improved electricity supply or only willing to pay less than the current charges?"

INTERVIEWER TO CODE

Code	Reason
01	Insufficient funds to cover cost of electricity
02	Do not believe we would get improved supply
03	Demand is already met from self-generation or other sources
04	Believes the current tariff is above the tariff in other States
05	Self-generation gives a better quality supply than the grid
06	Cost of electric pumpset too high
07	Other (please specify)

Interviewer's Name: ______________________________

Date:

Checked by TERI: ______________________________

1 ❑ Yes 2 ❑ No

Date:

ANNEX 2

SAMPLE DISTRIBUTION

INDUSTRIES

A2.1 Electrical zone-wise distribution of LT & HT industries surveyed in Haryana

Zone	LT	HT	Total
Panchkula	44	29	73
Delhi	141	211	352
Hisar	71	57	128
Total	*256*	*297*	*553*

A2.1.1 Electrical circle-wise distribution of LT & HT industries surveyed in each electrical zone in Haryana

Zone	Circle	LT	HT	Total
Panchukula	Ambala	19	13	32
	Yamunanagar	25	16	41
	Sub total	*44*	*29*	*73*
Delhi	Karnal	35	36	71
	Faridabad	37	64	101
	Sonipat	15	23	38
	Gurgaon	54	88	142
	Sub total	*141*	*211*	*352*
Hisar	Bhiwani	27	25	52
	Rohtak	22	23	45
	Hisar	22	9	31
	Sub total	*71*	*57*	*128*
Total		256	297	553

Zone	Circle	Division	Sanctioned load (hp)					Contract demand (kVA)					Total
			0-20	20-40	40 - 80	> 80	Total for LT industries	< 200	200 - 400	400 - 600	> 600	Total for HT industries	Grand total
Panchkula	Ambala	Panchkula		4	2		6	6	2			8	14
		Ambala City	4	2	2	1	9	2	1	1		4	13
		Ambala Canttt.	2	1		1	4			1		1	5
		Sub total	*6*	*7*	*4*	*2*	*19*	*8*	*3*	*2*		*13*	*32*
	Yamuna Nagar	Yamuna Nagar	2	5	2	2	11	2	2	1	4	9	20
		Jagadhri	2	9	2	1	14	4	2		1	7	21
		Sub total	*4*	*14*	*4*	*3*	*25*	*6*	*4*	*1*	*5*	*16*	*41*
	Total		10	21	8	5	44	14	7	3	5	29	73
Delhi	Karnal	Karnal City	1	5	2	4	12	5	1	1	1	8	20
		Sub-urban	3	1	1	2	7	4	3		1	8	15
		Panipat City	2	6	3	5	16	10	8	2		20	36
		Sub total	*6*	*12*	*6*	*11*	*35*	*19*	*12*	*3*	*2*	*36*	*71*
	Faridabad	Old Faridabad	1	6	4	4	15	8	8	2	6	24	39
		Faridabad	1	17	2	1	21	9	6	2	5	22	43
		Ballabhgarh		14	1	1	16	5	8	12	12	37	53
		Palwal		2			2		3	1	1	5	7
		Sub total	*2*	*39*	*7*	*6*	*54*	*22*	*25*	*17*	*24*	*88*	*142*
	Sonipat	Sonipat City	1	7	1	3	12	3	8	3	6	20	32
		Sub-urban		2		1	3	1		2		3	6
		Sub total	*1*	*9*	*1*	*4*	*15*	*4*	*8*	*5*	*6*	*23*	*38*
	Gurgaon	Gurgaon City	1	8	3	3	15	2	2	4	6	14	29
		Sub-urban		8	1	3	12	9	10	9	9	37	49
		OCC				3	3		1		4	5	8
		OP	5		2		7	2	4	2		8	15
		Sub total	*6*	*16*	*6*	*9*	*37*	*13*	*17*	*15*	*19*	*64*	*101*
	Total		15	76	20	30	141	58	62	40	51	211	352
Hisar	Bhiwani	Sub-urban	2	3	1	3	9			1		1	10
		City	1	7	4	1	13		4		4	8	21
		Sub total	*3*	*10*	*5*	*4*	*22*		*4*	*1*	*4*	*9*	*31*
	Rohtak	City	4	3	1	4	12	2	1	1	2	6	18
		Sub-urban				1	1	1			1	2	3
		Bahadurgarh	1	4	1	3	9	2	3	1	9	15	24
		Sub total	*5*	*7*	*2*	*8*	*22*	*5*	*4*	*2*	*12*	*23*	*45*
	Hisar	No.1	2	5	1	1	9	3	2	2	4	11	20
		No.2	2	1		1	4	1	1		3	5	9
		Hausi	2	1		2	5	1	1			2	7
		Fatehabad		4	1		5	1	1	2		4	9
		Tohana	3			1	4	1	1		1	3	7
		Sub total	*9*	*11*	*2*	*5*	*27*	*7*	*6*	*4*	*8*	*25*	*52*
	Total		17	28	9	17	71	12	14	7	24	57	128
Overall total			42	125	37	52	256	84	83	50	80	297	553

A2.2 Electrical zone wise distribution of LT & HT industries surveyed in Karnataka

Zone	LT	HT	Total
Bangalore	207	124	331
Mysore	49	50	99
Hubli	27	22	49
Gulbarga	11	11	22
Total	*294*	*207*	*501*

A2.2.1 Electrical circle-wise distribution of LT & HT industries surveyed in Karnataka

Zone	Circle	LT	HT	Total
Bangalore	Bangalore	191	118	309
	Tumkur	16	6	22
	Sub total	*207*	*124*	*331*
Mysore	Mysore	23	29	52
	Mangalore	10	10	20
	Shimoga	16	11	27
	Sub total	*49*	*50*	*99*
Hubli	Belgaum	8	9	17
	Hubli	19	13	32
	Sub total	*27*	*22*	*49*
Gulbarga	Munirabad	11	11	22
	Sub total	*11*	*11*	*22*
Total		294	207	501

A2.2.2 Electrical division - wise distribution of industries stratified by contracted load in Karnataka

Zone	Circle	Division	Sanctioned load (hp)					Contract demand (kVA)					
			0-20	20-40	40 - 80	> 80	Total of LT industries	< 200	200 - 400	400 - 600	> 600	Total of HT industries	Grand Total
Bangalore	Bangalore	Bangalore Central	3	6	2	3	14	3			1	4	18
		Bangalore East	4	3	10	4	21	5	4	2	7	18	39
		Bangalore North	2	11	19	19	51	7	7	2	9	25	76
		Bangalore Rural North	1	3	6	3	13	5	2	1	10	18	31
		Bangalore Rural South	3	2	11	5	21	2	11	4	3	20	41
		Bangalore South	5	6	19	21	51	10	6	3	7	26	77
		Bangalore West	6	2	5	7	20	5	2			7	27
		Sub total	*24*	*33*	*72*	*62*	*191*	*37*	*32*	*12*	*37*	*118*	309
	Tumkur	Tumkur		3	2	3	8	1		1	2	4	12
		KGF		1	1	2	4	1	1			2	6
		Kolar		2	1	1	4	2	8	3	13	26	30
		Sub total		*6*	*4*	*6*	*16*	*4*	*9*	*4*	*15*	*32*	48
	Total		24	39	76	68	207	41	41	16	52	150	357
Mysore	Mysore	Mysore	4	4	9	5	22		2	1		3	25
		Mandya	1				1	2	6	1	1	10	11
		Sub total	5	*4*	9	5	*23*	2	*8*	*2*	*1*	*13*	36
	Mangalore	Mangalore	3	1		6	10			1		1	11
		Sub total	*3*	*1*		*6*	*10*			*1*		*1*	11
	Shimoga	Chikmagalur		1	2	2	5	1	3	3	3	10	15
		Shimoga	1	2	4	4	11	4	3		2	9	20
		Sub total	*1*	*3*	*6*	*6*	*16*	*5*	*6*	*3*	*5*	*19*	35
	Total		9	8	15	17	49	7	14	6	6	33	82
Hubli	Belgaum	Belgaum		3	3	2	8		1			1	9
		Sub total		*3*	*3*	*2*	*8*		*1*			*1*	9
	Hubli	Chitradurga	2			1	3		1		1	2	5
		Dharwad	1		2		3	1			1	2	5
		Hubli	2	4	4	3	13	1	5		2	8	21
		Sub total	*5*	*4*	*6*	*4*	*19*	*2*	*6*		*4*	*12*	31
	Total		5	7	9	6	27	2	7		4	13	40
Gulbarga	Munirabad	Bellary	1	3	1	2	7		3	2	3	8	15
		Hospet		2	2		4			1	2	3	7
		Sub total	*1*	5	3	2	*11*		*3*	*3*	5	*11*	22
	Total		1	5	3	2	11		3	3	5	11	22
Overall total			39	59	103	93	294	50	65	25	67	207	501

AGRICULTURE

A2.3 Distribution of households surveyed by agro-ecological zones in Haryana

Zone	Description of agro-ecological zone	Sample size
2	Western plain, Kutch and part of Kathiawar peninsula	362
4	Northern plain and Central high lands including Aravalis	509
9	Northern plain, hot subhumid (dry) region	28
14	Western Himalayas, warm subhumid region	11
Total		*910*

A2.3.1 District-wise distribution of households surveyed in Haryana

District	Sample size
Bhiwani	43
Faridabad	27
Hisar	75
Kaithal	197
Kurukshetra	73
Mahendragarh	106
Panipat	69
Rewari	15
Sirsa	138
Sonipat	142
Yamunanagar	25
Total	*910*

A2.3.2 District-wise distribution of households surveyed under each agro-ecological zone in Haryana

District	Agro-ecological zone				Total
	2	4	9	14	
Bhiwani	43				43
Faridabad		27			27
Hisar	75				75
Kaithal		197			197
Kurukshetra		59	14		73
Mahendragarh	106				106
Panipat		69			69
Rewari		15			15
Sirsa	138				138
Sonipat		142			142
Yamunanagar			14	11	25
Total	***362***	***509***	***28***	***11***	***910***

A2.3.3 Number of households surveyed in various land holding categories in Haryana

Land holding category	No. of households	% of total sample
M (Marginal)	264	29.0
S (Small)	303	33.3
SM (Semi-medium)	194	21.3
ME(Medium)	112	12.3
L (Large)	37	4.0
Total	*910*	*100*

A2.3.4 Agro-ecological zone-wise distribution of households surveyed in various land holding categories in Haryana

Land holding category	Agro-ecological zone				Total
	2	4	9	14	
M (Marginal)	96	158	8	2	264
S (Small)	107	186	8	2	303
SM (Semi-medium)	80	100	7	7	194
ME (Medium)	57	51	4	-	112
L (Large)	22	14	1	-	37
Total	*362*	*509*	*28*	*11*	*910*

A2.4 Distribution of households surveyed by agro-ecological zones in Karnataka

Zone	Description of agro-ecological zone	Sample size
3	Deccan Plateau, hot-arid region	193
6	Deccan Plateau, semi-arid region	419
7	Deccan (Telangana) Plateau and Eastern Ghats	52
8	Eastern Ghats, TN uplands and Deccan (Karnataka region)	130
19	Western Ghats and coastal plains	114
Total		***908***

A2.4.1 District-wise distribution of households surveyed in Karnataka

District	Sample size
Belgaum	91
Bellary	125
Bidar	42
Chitradurga	68
Coorg	40
Dakshina kannada	74
Dharwad	78
Gulbarga	208
Mandya	30
Mysore	65
Raichur	52
Tumkur	35
Total	***908***

A2.4.2 District-wise distribution of households surveyed under each agro-ecological zone in Karnataka

District	Agro-ecological zone					Total
	3	6	7	8	19	
Belgaum		91				**91**
Bellary	125					**125**
Bidar		42				**42**
Chitradurga	68					**68**
Coorg					40	**40**
Dakshina Kannada					74	**74**
Dharwad		78				**78**
Gulbarga		208				**208**
Mandya				30		**30**
Mysore				65		**65**
Raichur			52			**52**
Tumkur				35		**35**
Total	***193***	***419***	***52***	***130***	***114***	***908***

A2.4.3 Number of households surveyed in various land holding categories in Karnataka

Land holding category	No. of households	% of total sample
M (Marginal)	174	19.0
S (Small)	291	32.0
SM (Semi-medium)	246	27.3
ME (Medium)	139	15.3
L (Large)	58	6.4
Total	*908*	*100*

A2.4.4 Agro-ecological zone-wise distribution of households surveyed in various land holding categories in Karnataka

Land holding category	Agro-ecological zone					Total
	3	6	7	8	19	
M (Marginal)	26	55	7	34	52	174
S (Small)	46	160	16	50	19	291
SM (Semi-medium)	61	111	24	34	16	246
ME (Medium)	41	68	4	10	16	139
L (Large)	19	25	1	2	11	58
Total	*193*	*419*	*52*	*130*	*114*	*908*

ANNEX 3

GENERAL INFORMATION FROM THE SURVEY

A3.1 Distribution of annual expenditure on agriculture in various land holding category in Haryana (Rs /Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	All
Expenditure on electricity	N	264	303	194	112	37	910
	Mean	1212	1959	2519	3174	8873	2292
	Std. Deviation	2163	2752	2890	3893	9949	3696
Expenditure on diesel	N	264	303	194	112	37	910
	Mean	2192	3954	8299	18864	41297	7723
	Std. Deviation	6821	6500	10551	18851	31709	14464
Expenditure on Water	N	264	303	194	112	37	910
	Mean	1030	1096	1098	1516	3129	1211
	Std. Deviation	1838	2287	2053	2670	4337	2324
Expenditure on agricultural transport	N	264	303	194	112	37	910
	Mean	972	810	1287	1833	2227	1142
	Std. Deviation	7455	1359	1366	1963	3719	4274
Other agricultural inputs	N	264	303	194	112	37	910
	Mean	10675	17402	32419	53372	138189	27990
	Std. Deviation	13781	14517	18902	32294	106603	38478

A3.1.2 Distribution of annual expenditure in various land holding categories of Zone 2[1] in Haryana (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	All
Expenditure on Electricity	N	96	107	80	57	22	362
	Mean	372	824	1284	1932	7285	1373
	Std. Deviation	1001	2091	1912	3118	8996	3332
Expenditure on Diesel	N	96	107	80	57	22	362
	Mean	1323	2188	5442	13284	37109	6547
	Std. Deviation	3909	5692	8657	16872	33094	14665
Expenditure on water	N	96	107	80	57	22	362
	Mean	1009	1751	1642	2345	3969	1758
	Std. Deviation	1468	2615	2273	3411	4160	2650
Expenditure on Agricultural Transport	N	96	107	80	57	22	362
	Mean	400	630	930	1909	2705	963
	Std. Deviation	586	1051	913	1971	4278	1646
Other agriculture inputs	N	96	107	80	57	22	362
	Mean	7868	15386	25463	45697	136727	27766
	Std. Deviation	6862	16276	15479	28115	105180	42837

[1] Western plain, Kutch and part of the Kathiawar peninsula

A3.1.3 Distribution of annual expenditure in various land holding categories of Zone 4[2] in Haryana (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	All
Expenditure on Electricity	N	158	186	100	51	14	509
	Mean	1626	2559	3481	4158	9753	2809
	Std. Deviation	2436	2881	3114	4051	9944	3599
Expenditure on Diesel	N	158	186	100	51	14	509
	Mean	2818	5087	10537	25119	48686	8660
	Std. Deviation	8212	6846	11690	19457	30280	14581
Expenditure on Water	N	158	186	100	51	14	509
	Mean	1051	776	783	709	2031	891
	Std. Deviation	2054	2051	1901	1077	4570	2060
Expenditure on Agricultural Transport	N	158	186	100	51	14	509
	Mean	1345	937	1593	1707	1636	1289
	Std. Deviation	9618	1528	1574	1976	2755	5531
Other agriculture inputs	N	158	186	100	51	14	509
	Mean	12430	18600	37582	60784	140714	28000
	Std. Deviation	16694	13692	19906	35726	116567	35900

[2] Northern plain and Central high lands including Aravalis

A3.1.4 Distribution of annual expenditure in various land holding categories of Zone 9[3] in Haryana (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	All
Expenditure on Electricity	N	8	8	7	4	1	28
	Mean	3413	3675	5400	8325	31500	5689
	Std. Deviation	3112	2739	2760	4962	-	6111
Expenditure on Diesel	N	8	8	7	4	1	28
	Mean	-	1313	6529	18625	30000	5739
	Std. Deviation	-	1870	6727	16357	-	10140
Expenditure on water	N	8	8	7	4	1	28
	Mean	875	-	286	-	-	321
	Std. Deviation	1642	-	756	-	.-	983
Expenditure on Agricultural Transport	N	8	8	7	4	1	28
	Mean	650	325	1014	2375	-	871
	Std. Deviation	721	296	1338	2056	.-	1223
Other agriculture inputs	N	8	8	7	4	1	28
	Mean	9000	16500	41429	68250	135000	32214
	Std. Deviation	7111	4811	17008	14569	.-	30749

[3] Northern plain, hot sub-humid (dry) region

A3.1.5 Distribution of annual expenditure in various land holding categories of Zone 14[4] in Haryana (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	Total
Expenditure on Electricity (agriculture)	N	2	2	7	-	-	11
	Mean	-	-	-	-	-	-
	Std. Deviation	-	-	-	-	-	-
Expenditure on Diesel	N	2	2	7	0	0	11
	Mean	3250	3650	10750	-	-	8095
	Std. Deviation	4596	1903	9561	-	-	8421
Expenditure on water	N	2	2	7	0	0	11
	Mean	1000	150	186	-	-	327
	Std. Deviation	1414	212	234	-	-	590
Expenditure on Agricultural Transport	N	2	2	7	0	0	11
	Mean	275	500	1286	-	-	959
	Std. Deviation	318	0	1753	-	-	1436
Other agriculture inputs	N	2	2	7	0	0	11
	Mean	13500	17500	29143	-	-	24182
	Std. Deviation	9192	3536	17705	-	-	15709

[4] Western himalayas, warm sub-humid region

A3.2 Distribution of annual expenditure in various land holding categories in Karnataka (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	All
Expenditure on electricity	N	174	289	246	139	58	906
	Mean	893	1060	1179	1788	3910	1354
	Std. Deviation	1258	1017	1122	2499	8568	2659
Expenditure on diesel	Mean	363	656	896	2445	8275	1425
	Std. Deviation	2421	3555	3785	9104	13903	6118
Expenditure on water	Mean	147	195	116	128	534	176
	Std. Deviation	1148	1540	740	914	3939	1506
Expenditure on agricultural transport	Mean	1136	1623	1848	2505	4066	1882
	Std. Deviation	1441	1891	1831	4030	5622	2719
Other agnculture inputs	Mean	8993	13957	20068	24107	30762	17289
	Std. Deviation	8674	9270	14263	15701	17259	13806

A3.2.1 Distribution of annual expenditure in various land holding categories of Zone 3[5] in Karnataka (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	ALL
Expenditure on Electricity	N	26	46	61	41	19	193
	Mean	881	1181	995	1139	1779	1132
	Std Deviation	908	1093	1134	740	1409	1070
Expenditure on diesel	N	26	46	61	41	19	193
	Mean	-	-	713	7	2445	468
	Std Deviation	-	-	4960	47	9214	4023
Expenditure of water for agriculture	N	26	46	61	41	19	193
	Mean	-	-	82	317	1579	249
	Std Deviation	-	-	526	1619	6882	2298
Expenditure on agricultural transport	N	26	46	61	41	19	193
	Mean	1077	1429	1769	1603	2266	1609
	Std Deviation	1025	1402	1445	1515	1896	1470
Other agricultural inputs	N	26	46	61	41	19	193
	Mean	12077	18359	23301	23338	30417	21319
	Std Deviation	9389	11453	14889	14439	14813	14123

[5] Deccan Plateau, hot-arid region

A3.2.2 Distribution of annual expenditure in various land holding categories of Zone 6[6] in Karnataka (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	ALL
Expenditure on electricity	N	55	160	111	68	25	419
	Mean	1036	1046	1341	2026	3927	1454
	Std Deviation	1012	860	1067	2933	6879	2306
Expenditure on diesel	N	55	160	111	68	25	419
	Mean	673	922	355	2885	10832	1649
	Std Deviation	4083	4480	2473	11580	16530	7392
Expenditure on water	N	55	160	111	68	25	419
	Mean	245	291	199	40	40	205
	Std Deviation	1627	2021	1017	256	200	1480
Expenditure on agriculture transport	N	55	160	111	68	25	419
	Mean	1161	1636	1724	2880	2788	1868
	Std Deviation	1064	2171	1848	5312	2701	2844
Other agriculture inputs	N	55	160	111	68	25	419
	Mean	9967	13981	18071	23225	30750	17039
	Std Deviation	9363	8788	12408	15489	17527	12854

[6] Deccan Plateau, semi-arid region

A3.2.3 Distribution of annual expenditure in various land holding categories of Zone 7[7] in Karnataka (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	ALL
Expenditure on electricity	N	7	16	24	4	1	52
	Mean	857	928	1138	1250	3000	1080
	Std Deviation	635	778	880	866	-	842
Expenditure on diesel	N	7	16	24	4	1	52
	Mean	679	2260	3164	3250	14000	2766
	Std Deviation	1795	4957	5834	3948	.-	5208
Expenditure from water	N	7	16	24	4	1	52
	Mean	14	44	0	38	-	18
	Std Deviation	38	150	0	75	-	87
Expenditure on agriculture transport	N	7	16	24	4	1	52
	Mean	1357	1719	1369	2625	1000	1564
	Std Deviation	1654	1278	809	750	-	1121
Other agriculture inputs	N	7	16	24	4	1	52
	Mean	9143	12438	18188	27500	25000	16048
	Std Deviation	3388	4802	11274	6455	-	9620

[7] Eastern Ghats, TN Uplands and Deccan (Karnataka) region

A3.2.4 Distribution of annual expenditure in various land holding categories of Zone 8[8] in Karnataka (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	ALL
Expenditure on electricity	N	34	50	34	10	2	130
	Mean	945	1201	1260	3210	3150	1334
	Std Deviation	983	1487	1133	3511	4455	1674
Expenditure on diesel	N	34	50	34	10	2	130
	Mean	305	61	201	1792	6400	392
	Std Deviation	953	273	734	2993	2263	1352
Expenditure on water	N	34	50	34	10	2	130
	Mean	324	192	44	200	0	185
	Std Deviation	1571	827	257	632	0	973
Expenditure on agricultural transport	N	34	50	34	10	2	130
	Mean	1784	1716	2090	3540	1000	1961
	Std Deviation	2341	1627	1952	3195	1414	2086
Other agriculture inputs	N	34	50	34	10	2	130
	Mean	12088	11550	21822	27000	42500	16042
	Std Deviation	9396	8090	16535	20859	10607	13767

[8] Western Ghats and Coastal Plains

A3.2.5 Distribution of annual expenditure in various land holding categories of Zone 19[9] in Karnataka (Rs/Annum)

Type of expenditure	Statistics	Land holding category					
		M	S	SM	ME	L	ALL
Expenditure on electricity	N	52	19	16	16	11	114
	Mean	719	511	647	1688	7774	1491
	Std Deviation	1775	450	1549	2682	16554	5600
Expenditure on diesel	N	52	19	16	16	11	114
	Mean	212	221	3423	7031	12355	2793
	Std Deviation	1031	699	4346	10728	13766	7127
Expenditure on water	N	52	19	16	16	11	114
	Mean	19	-	-	-	-	9
	Std Deviation	97	-	-	-	-	66
Expenditure on agriculture transport	N	52	19	16	16	11	114
	Mean	686	1653	3216	2547	10918	2450
	Std Deviation	982	1533	3051	2735	9554	4441
Other agriculture inputs	N	52	19	16	16	11	114
	Mean	4375	10711	20683	27172	29775	13370
	Std Deviation	5170	9913	20630	18631	22854	16603

[9] Deccan (Telangana) Plateau and Eastern Ghats

A3.3 Distribution of sources of water used for irrigation in different land holding categories in Haryana

Sources of water	Land holding category					
	M	S	SM	ME	L	All
Own borewell	161	239	170	93	34	697
Other farmer's borewell	101	87	43	29	6	266
Own open well		2	1			3
Other farmer's openwell		1				1
Canal	100	110	73	59	22	364
Other sources (rivers, etc.)	3	6	3	2	1	15
No of households	258	300	193	111	37	899

A3.3.1 Zone-wise distribution of sources of water used for irrigation in different land holding categories in Haryana

Zone	Land holding category					
	M	S	SM	ME	L	All
Zone 2: Western plain, Kutch and part of the Kathiawar peninsula						
Own borewell	37	41	22	18	3	121
Other farmer's borewell	1	2	3	4	5	15
Own open well	48	57	59	38	19	221
Other farmer's openwell						
Canal	42	51	45	37	19	194
Other sources (rivers, etc.)		2	1			3
No of farmers	93	104	79	54	22	352
Zone 4: Northern plains and central high lands including the aravalis						
Own borewell	107	172	97	51	14	441
Other farmer's borewell	62	46	20	11	3	142
Own open well						
Other farmer's openwell		1				1
Water from canal	55	57	23	20	1	156
Other sources				1		1
No of farmers	157	186	100	51	14	508
Zone 9: Northern plain, hot sub-humid (dry) region						
Own borewell	5	8	7	4	1	25
Other farmer's borewell	1		1			2
Own open well						
Other farmer's openwell						
Canal						
Other sources						
No of farmers	6	8	7	4	1	26
Zone 14: Western himalayas, warm sub-humid region						
Own borewell	1	2	7			10
Other farmer's borewell	1					1
Own open well						
Other farmer's openwell						
Water from canal		1	3			4
No of farmers	2	2	7			11

A3.3.2 District-wise distribution of sources of water used for irrigation in different land holding categories in Zone 2 in Haryana

District	Land holding category					
Bhiwani	M	S	SM	ME	L	All
Own borewell	5	5	4	4	3	21
Other farmer's borewell	5	7				12
Own open well						
Other farmer's openwell						
Water from canal		4	1	1	3	9
Other sources		1				1
No of farmers	9	15	4	4	3	35
Hisar						
Own borewell	22	14	13	4	2	55
Other farmer's borewell	5	3	2			10
Own open well						
Other farmer's openwell						
Water from canal	30	21	14	4	2	71
Other sources		2				2
No of farmers	32	21	16	4	2	75
Mahendergarh						
Own borewell	14	22	20	14	3	73
Other farmer's borewell	15	22	13	10	1	61
Own open well		1	1			2
Other farmer's openwell						
Water from canal	1	5	3	5	1	15
Other sources						
No of farmers	27	38	22	16	3	106
Sirsa						
Own borewell	7	16	22	16	11	72
Other farmer's borewell	12	9	7	8	2	38
Own open well		1				1
Other farmer's openwell						
Water from canal	11	21	27	27	13	99
Other sources	3	3	3	1	1	11
No of farmers	25	30	37	30	14	136

A3.3.3 District-wise distribution of sources of water used for irrigation in different land holding categories in Zone 4 in Haryana

District	Land holding category					
Faridabad	M	S	SM	ME	L	Total
Own borewell	2	4	10	7	3	26
Other farmer's borewell	2	2	5	3		12
Own open well						
Other farmer's openwell						
Water from canal		2	1	1		4
Other sources						
No of farmers	3	4	10	7	3	27
Kaithal	M	S	SM	ME	L	Total
Own borewell	31	57	53	20	6	167
Other farmer's borewell	21	16	15	1	1	54
Own open well						
Other farmer's openwell		1				1
Water from canal	20	10	15	5		50
Other sources						
No of farmers	50	64	56	20	6	196
Kurukshetra						
Own borewell	19	21	11	3	1	55
Other farmer's borewell	3	2				5
Own open well						
Other farmer's openwell						
Water from canal	5	6	3	3	1	18
Other sources						
No of farmers	22	22	11	3	1	59
Panipat						
Own borewell	19	30	7	3		59
Other farmer's borewell	11	9		1		21
Own open well						
Other farmer's openwell						
Water from canal	1		1			2
Other sources						
No of farmers	28	31	7	3		69
Rewari						
Own borewell	1	6	6	1		14
Other farmer's borewell		2		1		3
Own open well						
Other farmer's openwell						
Water from canal		1	1			2
Other sources						
No of farmers	1	7	6	1		15
Sonipat						
Own borewell	35	54	10	17	4	120
Other farmer's borewell	25	15		5	2	47
Own open well						
Other farmer's openwell						
Water from canal	29	38	2	11		80
Other sources				1		1
No of farmers	53	58	10	17	4	142

A3.3.4 District-wise distribution of sources of water used for irrigation in different land holding categories in Zone 9 in Haryana

District	Land holding category					
Kurukshetra	M	S	SM	ME	L	Total
Own borewell	5	2	3	2	1	13
Other farmer's borewell						
Own open well						
Other farmer's openwell						
Water from canal						
Other sources						
No of farmers	5	2	3	2	1	13
Yamuna Nagar						
Own borewell		6	4	2		12
Other farmer's borewell	1		1			2
Own open well						
Other farmer's openwell						
Water from canal						
Other sources						
No of farmers	1	6	4	2		13

A3.3.5 District-wise distribution of sources of water used for irrigation in different land holding categories in Zone 14 in Haryana

District	Land holding category					
Yamuna Nagar	M	S	SM	ME	L	Total
Own borewell	1	2	7			10
Other farmer's borewell	1					1
Own open well						
Other farmer's openwell						
Water from canal		1	3			4
Other sources						
No of farmers	2	2	7			11

A3.4 Distribution of sources of water used for irrigation in different land holding categories in Karnataka

Sources of water	Land holding category					
	M	S	SM	ME	L	Total
Own borewell	48	123	88	57	22	338
Other farmer's borewell	1	1		1		3
Own open well	90	123	99	46	10	368
Other farmer's openwell	4	4	1			9
Canal		5	8	4	1	18
No of farmers	136	231	179	96	31	673

A3.4.1 Zone-wise distribution of sources of water used for irrigation in different land holding categories in Karnataka

Zone	Land holding category					
	M	S	SM	ME	L	Total
Zone 3: Deccan Plateau, hot-arid region						
Own borewell	24	42	50	34	14	164
Other farmer's borewell				1		1
Own open well	5	2	7	3	1	18
Other farmer's openwell		1				1
Canal						
No of farmers	24	42	51	36	14	167
Zone 6: Deccan Plateau, semi-arid region						
Own borewell	10	48	18	18	7	101
Other farmer's borewell		1				1
Own open well	28	79	60	35	9	211
Other farmer's openwell		1				1
Canal			2	2		4
No of farmers	36	114	75	46	15	286
Zone 7: Deccan (Telangana) Plateau and Eastern Ghats						
Own borewell						
Other farmer's borewell						
Own open well	7	15	19	2		43
Other farmer's openwell						
Canal		1				1
No of farmers	7	15	19	2		43
Zone 8: Eastern Ghats, TN uplands and Deccan (Karnataka region)						
Own borewell	14	32	20	5		71
Other farmer's borewell	1					1
Own open well	12	14	10	3		39
Other farmer's openwell	1	2	1			4
Canal		3	3			6
No of farmers	28	46	28	7		109

A3.4.1 Contd./-

A3.4.1 Continued

Zone	Land holding category					
	M	S	SM	ME	L	Total
Zone 19: Western Ghats and coastal plains						
Own borewell		1			1	2
Other farmer's borewell						
Own open well	38	13	3	3		57
Other farmer's openwell	3					3
Canal		1	3	2	1	7
No of farmers	41	14	6	5	2	68

A3.4.2 District-wise distribution of sources of water used for irrigation in different land holding categories in Zone 3 in Karnataka

District	Land holding category					
Bellary	M	S	SM	ME	L	Total
Own borewell	6	22	31	28	12	99
Other farmer's borewell				1		1
Own open well			2	2		4
Other farmer's openwell						
Canal						
No of farmers	6	22	31	29	12	100
Chitradurga						
Own borewell	18	20	19	6	2	65
Other farmer's borewell						
Own open well	5	2	5	1	1	14
Other farmer's openwell		1				1
Canal						
No of farmers	18	20	20	7	2	67

A3.4.3 District-wise distribution of sources of water used for irrigation in different land holding categories in Zone 6 in Karnataka

District	Land holding category					
Belgaum	M	S	SM	ME	L	Total
Own borewell	2	28	5	2	2	39
Other farmer's borewell						
Own open well	6	12	5	4	1	28
Other farmer's openwell						
Canal						
No of farmers	8	35	10	6	3	62
Bidar						
Own borewell	1			1	1	3
Other farmer's borewell						
Own open well	4	15	11	4	1	35
Other farmer's openwell						
Canal						
No of farmers	4	15	11	4	2	36
Dharwad						
Own borewell	3	5	6	2	3	19
Other farmer's borewell		1				1
Own open well	1			1		2
Other farmer's openwell		1				1
Canal						
No of farmers	4	7	6	3	3	23
Gulbarga						
Own borewell	4	15	7	13	1	40
Other farmer's borewell						
Own open well	17	52	44	26	7	146
Other farmer's openwell						
Canal			2	2		4
No of farmers	20	57	48	33	7	165

A3.4.4 District-wise distribution of sources of water used for irrigation in different land holding categories in Zone 7 in Karnataka

District	Land holding category					
Raichur	M	S	SM	ME	L	Total
Own borewell						
Other farmer's borewell						
Own open well	7	15	19	2		43
Other farmer's openwell						
Canal		1				1
No of farmers	7	15	19	2		43

A3.4.5 District-wise distribution of sources of water used for irrigation in different land holding categories in Zone 8 in Karnataka

District	Land holding category					
Mandya	M	S	SM	ME	L	Total
Own borewell						
Other farmer's borewell						
Own open well	8	9	7	1		25
Other farmer's openwell	1	2	1			4
Canal		3	3			6
No of farmers	9	11	7	1		28
Mysore						
Own borewell	11	19	13	2		45
Other farmer's borewell						
Own open well	2	4	1	1		8
Other farmer's openwell						
Canal						
No of farmers	13	22	13	3		51
Tumkur						
Own borewell	3	13	7	3		26
Other farmer's borewell	1					1
Own open well	2	1	2	1		6
Other farmer's openwell						
Canal						
No of farmers	6	13	8	3		30

A3.4.6 District-wise distribution of sources of water used for irrigation in different land holding categories in Zone 19 in Karnataka

District	Land holding category					
Coorg	M	S	SM	ME	L	Total
Own borewell					1	1
Other farmer's borewell						
Own open well		1		2		3
Other farmer's openwell						
Canal			3	2	1	6
No of farmers		1	3	4	2	10
Dakshina Kannada						
Own borewell		1				1
Other farmer's borewell						
Own open well	38	12	3	1		54
Other farmer's openwell	3					3
Canal		1				1
No of farmers	41	13	3	1		58

ANNEX 4

CURRENT TARIFFS IN INDUSTRIAL SECTOR IN HARYANA AND KARNATAKA

A4.1 Industry

There are several concepts to pricing electricity. The most basic concept is to charge a single price for the number of units of power consumed. An improvement to the basic concept is the two-part tariff system, where a consumer is charged for both capacities created and energy consumed. A per kVA (kW) charges is levied to recover capacity costs while a variable energy charge is applicable to recover variable costs of power generation and profit margins. Additionally utilities can also levy minimum charges to recover its fixed costs of creating and maintaining generation, transmission and distribution capacities irrespective of the quantum of energy consumed by the consumers.

Single-part tariff

In a single-part tariff system, a straightforward energy charge is applicable on the units of energy consumed. Usually the tariffs are declared by the Utility in advance for different classes of consumers. In a variant of single part tariff system, there can be levels of tariffs for a consumer, e.g., for consumption within 1-100 units Rupee 1 per unit will be the tariff, for consumption above 100 units Rs 1.50 may be the tariff applicable.

To illustrate, let us consider that in state A single part tariff system is applicable. In this state for consumer X (with contract demand 100 kVA) the tariffs are Rs 1.50 for upto 50000 units of power consumed and Rs 2.00 for more than 50000 units. Then if his monthly power consumption is 70000 units, his monthly electricity bill will be:

Rs 1.5 × 50,000 units + Rs 2.00 × 20,000 units = Rs 1,15,000/-.

If along with single-part tariff system, minimum charges are also applicable, then a consumer monthly electricity bill will be at least equal to minimum charges, irrespective of whether he is consuming power or not.

Continuing the above example, if consumer X had only consumed 5,000 units in a month, his monthly bill with minimum tariffs would have been:

Rs 1.50 × 5,000 units = Rs 7,500/-.

However if minimum charges of Rs 100 per kVA were in existence in state A, then for consumer X the minimum charges are:

Rs 100 × 100 kVA = Rs 10,000/-.

Consumer X monthly bill would be then Max (7,500, 10,000) = Rs 10,000/-

Two-part tariff

The two-part tariff system is composed of two components. One is the energy charge applicable on the units of power consumed and another is the demand charge applicable on the total maximum-metered demand of the consumer for a single month.

For example if now in State A two part tariff system is applicable on consumer X. The tariffs are Rs 1.50 per unit of power consumed and Rs 150 per kVA of maximum demand. Thus if the consumer in a given month consumes 70,000 units and his maximum demand is 100 kVA, then according to the two part tariff system his monthly electricity bill will be :

Rs 1.50 × 70,000 units + Rs 150 × 100 kVA = Rs 1,20,000/-.

Furthering the above example, lets assume that along with two-part tariffs a minimum charges (75% of contract demand and 20% of maximum energy that can be consumed) are also applicable in State A, then the minimum charges for Consumer X would be :

Rs 150 × 100 kVA × 75% + Rs 1.50 × 100 kVA × 24 Hrs × 30 Days × 0.9 Pf[1] × 0.2 = Rs 30,690/-.

Thus for the consumer the charges applicable are Max(30,690, 1,20,000) = Rs 1,20,000 currently.

Now lets assume that Consumer X consumption is only 200 units in a given month and the maximum demand used is 25 kVA, then under the two-part tariff system without minimum charges, his electricity bill would be:

Rs 150 × 25 kVA + Rs 1.50 × 200 units = Rs 4,050/-.

[1] Pf is the power factor of the unit, and explains the useful work done in kW for a given amount of kVA.

However, if minimum charges as given above are applicable then his monthly electricity bill would be Max(30,690, 4,050) = Rs 30,690/-.

Penalty charges

Besides normal charges for energy consumption and demand, utilities also levy penality charges if a consumer delays payments or if his maximum kVA demand exceeds the contract demand in a month or if the power factor in his unit is not within the range prescribed by the utility.

Tariffs in Haryana

In Haryana industries with Sanctioned Load upto 70 kW are defined as LT industries while industries with Sanctioned Load / Contract Demand above 70 kW are defined as HT industries. The net tariff chargeable to both these classes of consumers with effect from June 1998 is Rs 4.02 per kWh. The same categories have been used in analyzing and discussing the results obtained from Haryana sample.

A4.1.1 Electricity tariffs for Industry in Haryana

Tariff Category	Sanctioned Load (SL) / Contract Demand (CD)	Energy Charge	Monthly Minimum Charges	Remarks
HT	CD ≥ 70 kW	Rs 4.02 per kWh (includes 10 Paise electricity duty)	a) HT Industrial Supply Rs 70 per kVA b) Steel furnace supply Rs 140 per kVA..	Steel furnace surcharges @ 15 paise per kWh
LT	0 ≤ SL < 70 kW	Rs 4.02 per kWh (includes 10 Paise electricity duty)	Rs 60/- per kW or part thereof.	

Tariffs in Karnataka

In Karnataka currently a two-part tariff system with minimum charges is currently applicable, whereas in Haryana it is single part tariff system, with minimum charges is exiting.

In Karnataka, KEB has defined five tariff categories for industries to levy energy charges. One of them is for HT and the other four for LT industries. These categories are listed out below:

A4.1.2 Electricity tariffs for Industry in Karnataka

Tariff Category	Sanctioned Load (SL) / Contract Demand (CD)	Energy Charge	Fixed Charge per month
LT 5a	< 40 HP[2]	210 Paisa per kWh	Rs 22 per HP
LT 5b	40 ≤ SL < 67 HP	250 Paisa per kWh	Rs 28 per HP (if 40 ≤ SL ≤ 50) Rs 35 per HP (if 50 HP < SL < 67 HP)
LT 5c	67 ≤ SL ≤ 100 HP	265 Paisa per kWh	Rs 55 per HP
LT 5d	SL ≥ 100 HP	300 Paisa per kWh	Rs 140 per HP
HT 2a	CD ≥ 63 kVA	310 Paisa per kWh till 1,00,000 kWh 340 Paisa per kWh for above 1,00,000 kWh and upto 2,00,000 kWh 355 Paisa per kWh for balance units per month	Rs 150 per kVA

While analyzing the cost of electricity for the industrial consumers, all LT categories have been clubbed together into a single LT classification, and the HT2a has been classified as HT.

[2] HP stands for horse power.

ANNEX 5

SURVEY RESULTS FOR INDUSTRIES

A 5.1 Profile of sample industries surveyed in the two states

Type of industry	Share of industries in sample %		Average total sales Million Rs/yr/ind		Average electricity purchased Million kWh/yr/ind		Average electricity generated Million kWh/yr/ind		Average electricity consumed Million kWh/yr/ind		Average production cost Million Rs/yr/ind		Share of electricity purchased %		Production losses Million Rs/yr		Sanctioned load kW	kW
	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka
Food products and beverages	10 49	8 18	164	99	0 53	0.24	1 38	0 08	1 90	0.31	131	83	10 24	9 93	7 10	6 22	361	297
Tobacco products				3002		0.94		0 01		0.95		2651		3 55		114 45		1547
Textiles	11.03	3.19	76	89	0 50	1.35	0.91	1.58	1.41	2 92	65	62	9.75	10.38	5.28	2 31	361	833
Wearing apparel, dressing	1.08	0.80	222	64	0.50	0.12	0.25	0 01	0.75	0 12	193	18	3 90	5 88	3 30	1.40	382	353
Leather and its products	1.99	0.40	100	116	0 28	0.44	0 25	1 15	0.53	1.59	77	103	9.25	3.07	2.28	0 05	397	880
Wood and wood products	3.25	1.60	28	26	0.15	0.04	1.28	0.03	1.43	0.07	34	22	9 07	3 80	1 08	0 47	350	254
Paper and paper products	2.35	2.00	375	30	0.98	0.58	11.74	0.28	12.72	0 87	365	27	10.94	5.32	6 96	0 45	1791	886
Printing and publishing		0.60		7		0.04		0.00		0 05		6		3 61		0 08		139
Chemical and chemical products	7.23	6.79	89	418	0 36	1.70	0.29	10 95	0.65	12 64	67	301	12.34	6 14	7.44	5 73	271	1377
Rubber and plastic products	7.59	7.58	30	187	0 31	0.61	0.17	0.60	0.48	1.21	23	157	11.73	10 76	1 92	1 19	194	1157
Other non-metallic mineral products	3.25	4.99	268	147	2.00	0.63	2.31	0.42	4.31	1.05	204	93	15.42	12 64	16 08	0 18	2001	809
Basic metals	7.05	5.79	176	257	1 03	3.50	0.55	0.25	1.58	3.62	147	198	9 17	11 65	5 76	3 98	1039	3179
Metal products and parts	11.93	19.96	52	29	0.48	0.14	0.22	0.01	0.70	0.16	48	26	9.01	7.01	3.60	1 17	284	315
Machine and tools	13.74	11.78	143	134	0 23	0.12	0.21	0 08	0.44	0 19	121	112	6 15	5 46	2 04	12 00	328	327
Office accounting & computing machinery	0.36	0.60	13	85	0.05	0.42	0.02	0.16	0.08	0 58	11	59	2.30	4.36	0 16		43	425

A 5.1 Contd./-

A 5.1 Continued

Type of industry	Share of industries in sample %		Average total sales Million Rs/yr/ind		Average electricity purchased Million kWh/yr/ind		Average electricity generated Million kWh/yr/ind		Average electricity consumed Million kWh/yr/ind		Average production cost Million Rs/yr/ind		Share of electricity purchased %		Production losses Million Rs/yr.		Sanctioned load kW	kW
	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka	Haryana	Karnataka
Electrical machinery and apparatus	3.98	8 78	136	215	0 29	0.32	0.56	0.33	0.85	0.65	105	152	6.35	3.41	26.87	8.31	462	644
Radio, TV, communication equipment	1.45	2 59	19	925	0 06	0.28	0.07	0.10	0.13	0.38	15	618	9.22	3.56	0.63	43.39	131	420
Medical equipments	1 81	2.99	140	43	0.45	0.07	0 45	0.03	0.90	0.10	106	10	6.83	4.69	0.30	0.67	241	174
Motor vehicles, trailers & semi-trailers	8.86	4 39	205	102	0 52	0.47	0.23	0.73	0.75	1.20	148	76	6.53	5.81	13.23	6.76	464	756
Other transport equipment	1.63	1.20	41	580	0 43	4.13	0.21	5.72	0.65	9.85	35	506	5.06	7.16	0.48	5.70	463	2825
Furniture	0.90	5.39	17	6	0 21	0.02	0.12	0 00	0.32	0.02	13	4	7.89	6.09	0.73	0.38	101	203
All together	100	100	122	173	0.50	0.61	0.83	0.99	1.32[a]	1.59	100	132	9.00	7.14	6.98	5.80	466	911

[a] Average electricity consumption may not match the sum of average electricity purchased and generated due to rounding-off.

A5.2 Magnitude of power problems in HT and LT industries in Haryana – Average Score

Problems	HT	LT	All
Voltage problem	2.62*	2.27	2.46
Frequency	1.06	0.68	0.89
Scheduled cut	0.58	0.49	0.54
Unscheduled cut	3.75	3.54	3.65
Demand Cut/Peak Load cut	2.40	1.48	1.97
No Response to complaints	1.21	1.46	1.32
Unofficial payments	1.14	1.01	1.08
Difficult to get new connection	1.39	1.59	1.48
Difficult to get add load	1.25	1.28	1.26
Other[1] (specify)	0.81	0.76	0.79

* Respondents were asked to list the problems they faced with the grid supply and then rate them from 1 to 5 as per the severity of the problem faced (5 depicting the most serious problem and 1 the least). A score of 0 was assigned to a problem if the respondent was not experiencing it.

A5.2.1 Magnitude of power problems in industries classified by electrical Circles in Haryana – Average Score

Problems	Circles									
	Ambala	Yamunanagar	Karnal	Faridabad	Sonipat	Gurgaon	Bhiwani	Rohtak	Hisar	Total
Voltage	2.03	1.98	2.73	2.71	2.39	2.32	1.96	3.09	2.68	2.46
Frequency	0.56	0.85	0.72	0.82	0.92	1.20	0.56	1.16	0.52	0.89
Scheduled	0.72	1.10	0.58	0.38	0.32	0.52	0.52	0.56	0.35	0.54
Unscheduled	3.00	3.17	3.62	3.89	4.03	3.74	3.02	4.02	3.90	3.65
Demand Cut/Peak Load Cut	3.28	1.49	1.73	2.23	2.32	1.35	2.27	2.71	1.87	1.97
No Response to complaints	0.75	0.83	1.69	1.34	0.87	1.35	1.27	1.58	1.81	1.32
Unofficial payments	0.88	0.68	1.56	1.35	0.37	1.11	0.71	1.07	1.16	1.08
Difficult to get new connection	2.19	1.78	2.17	1.49	1.34	0.58	1.67	1.47	2.77	1.48
Difficult to get add load	2.13	1.56	1.55	1.33	1.13	0.65	1.31	1.31	1.90	1.26
Other (specify)	1.09	0.88	0.84	0.97	1.10	0.59	0.66	1.04	0.84	0.84

[1] Other problems includes transformer burn outs, phase reversal, delay in maintenance, very high tariff rates, wrong billing, etc.,

A5.2.2 Magnitude of power problems by sanctioned load in LT industries in Haryana – Average Score

Problems	Sanctioned load (hp)				
	0-20	20-40	40-80	>80	Total
Voltage problem	2.45	1.98	2.38	2.73	2.27
Frequency	0.10	0.70	1.14	0.79	0.68
Scheduled	0.40	0.47	0.57	0.54	0.49
Unscheduled	3.43	3.56	3.30	3.75	3.54
Demand Cut/Peak Load Cut	1.55	1.35	1.14	2.00	1.48
No Response to complaints	1.10	1.61	1.24	1.54	1.46
Unofficial payments	1.19	1.13	0.59	0.87	1.01
Difficult to get new connection	1.55	1.26	1.38	2.56	1.59
Difficult to get add load	0.88	1.10	1.24	2.06	1.28
Other (specify)	1.36	0.58	1.27	0.35	0.76

A5.2.3 Magnitude of power problems by contract demand in HT industries in Haryana – Average Score

Problems	Contract demand (kVA)				
	<200	200-400	400-600	>600	Total
Voltage problem	2.56	2.46	2.80	2.74	2.62
Frequency	0.93	0.83	0.94	1.53	1.06
Scheduled cuts	0.71	0.36	0.42	0.75	0.58
Unscheduled cuts	3.51	4.06	3.86	3.60	3.75
Demand Cut/Peak Load Cut	2.26	2.45	2.12	2.66	2.40
No Response to complaints	1.25	0.99	0.92	1.56	1.21
Unofficial payments	1.21	1.53	0.96	0.76	1.14
Difficult to get new connection	0.98	1.73	1.42	1.45	1.39
Difficult to get add load	1.04	1.30	1.20	1.44	1.25
Other (specify)	0.96	0.80	0.72	0.71	0.81

A5.2.4 Magnitude of power problems by electrical Circles stratified by load in Haryana – Average Score

Circle	Problems	Sanctioned load (hp)					Contract demand (kVA)					
		0-20	20-40	40-80	>80	Total	<200	200-400	400-600	>600	Total	Grand Total
Ambala	Voltage	1.83	1.71	2.25	1.50	1.84	2.00	3.00	2.50	-	2.31	2.03
	Frequency	0.00	0.57	0.25	0.00	0.26	1.63	0.00	0.00	-	1.00	0.56
	Scheduled	0.00	1.57	0.00	0.00	0.58	1.50	0.00	0.00	-	0.92	0.72
	Unscheduled	2.33	2.57	2.00	5.00	2.63	3.13	4.00	4.50	-	3.54	3.00
	Demand Cut/Peak Load Cut	3.17	2.14	2.50	4.50	2.79	4.00	3.33	5.00	-	4.00	3.28
	No Response to complaints	0.50	1.43	0.75	0.00	0.84	0.63	0.00	1.50	-	0.62	0.75
	Unofficial payments	0.00	2.29	0.50	0.00	0.95	1.00	0.00	1.00	-	0.77	0.88
	Difficult to get new connection	1.33	3.14	0.75	5.00	2.26	1.75	1.67	4.00	-	2.08	2.19
	Difficult to get add load	1.33	3.71	0.75	5.00	2.47	1.00	1.67	4.00	-	1.62	2.13
	Other (specify)	2.50	0.00	0.00	0.00	0.79	1.88	1.67	0.00	0.00	1.54	1.09
Yamunanagar	Voltage	0.50	1.79	0.25	2.33	1.40	2.33	3.25	4.00	3.00	2.88	1.98
	Frequency	0.00	0.86	0.00	1.00	0.60	0.67	2.50	0.00	1.20	1.25	0.85
	Scheduled	1.25	0.79	2.50	0.33	1.08	0.83	0.00	0.00	2.60	1.13	1.10
	Unscheduled	3.50	3.21	2.25	2.67	3.04	3.67	3.75	3.00	2.80	3.38	3.17
	Demand Cut/Peak Load Cut	0.00	1.07	1.00	0.00	0.76	2.50	1.75	0.00	4.00	2.63	1.49
	No Response to complaints	0.25	1.14	0.75	0.00	0.80	2.00	0.00	0.00	0.40	0.88	0.83
	Unofficial payments	0.75	1.07	0.50	0.00	0.80	0.83	0.75	0.00	0.00	0.50	0.68
	Difficult to get new connection	2.50	2.00	1.00	2.67	2.00	2.17	1.25	0.00	1.00	1.44	1.78
	Difficult to get add load	1.25	1.93	0.00	3.00	1.64	1.67	2.00	0.00	1.00	1.44	1.56
	Other (specify)	0.00	0.29	2.50	0.00	0.56	2.50	0.00	0.00	1.40	1.38	0.88
Karnal	Voltage	3.50	1.33	3.17	2.64	2.43	3.21	3.42	2.00	0.50	3.03	2.73
	Frequency	0.67	0.75	1.00	1.09	0.89	0.37	0.83	1.00	0.00	0.56	0.72
	Scheduled	0.83	0.00	0.83	0.18	0.34	1.32	0.33	0.00	0.00	0.81	0.58
	Unscheduled	3.00	3.58	3.83	3.91	3.63	3.47	4.42	3.67	0.00	3.61	3.62
	Demand Cut/Peak Load Cut	0.67	0.83	0.67	1.82	1.09	2.21	2.92	2.67	0.00	2.36	1.73
	No Response to complaints	2.50	2.92	0.83	0.91	1.86	1.68	1.08	1.67	2.50	1.53	1.69
	Unofficial payments	3.00	1.75	0.83	0.91	1.54	1.26	2.00	1.67	2.00	1.58	1.56
	Difficult to get new connection	2.17	2.17	1.33	3.00	2.29	0.79	3.83	3.00	2.00	2.06	2.17
	Difficult to get add load	0.00	1.08	1.33	2.55	1.40	0.63	3.00	3.00	2.00	1.69	1.55
	Other (specify)	0.83	0.25	0.00	0.45	0.37	1.58	1.42	0.00	0.00	1.31	0.85
Faridabad	Voltage	0.67	2.38	3.00	3.67	2.51	3.54	2.53	2.67	2.74	2.83	2.71
	Frequency	0.00	0.19	1.67	0.89	0.57	1.00	0.53	0.87	1.42	0.97	0.82
	Scheduled	0.00	1.06	0.00	0.78	0.65	0.00	0.18	0.27	0.37	0.22	0.38
	Unscheduled	3.50	3.81	3.83	4.00	3.81	4.31	4.35	3.87	3.37	3.94	3.89
	Demand Cut/Peak Load Cut	1.33	1.63	1.17	1.44	1.46	2.23	2.65	2.60	3.05	2.67	2.23
	No Response to complaints	1.00	1.88	2.50	1.89	1.84	1.38	0.71	0.80	1.32	1.05	1.34
	Unofficial payments	0.83	1.81	0.67	1.56	1.41	1.92	1.59	1.00	0.89	1.31	1.35
	Difficult to get new connection	0.00	1.31	1.83	2.11	1.38	0.77	1.82	1.80	1.63	1.55	1.49
	Difficult to get add load	0.00	1.00	2.50	1.78	1.27	1.08	1.12	1.67	1.53	1.36	1.33
	Other (specify)	3.83	0.81	2.83	0.89	1.65	0.38	0.76	0.27	0.79	0.58	0.97

A5.2.4 Contd./-

A5.2.4 Continued

Circle	Problems	Sanctioned load (hp)					Contract demand (kVA)					
		0-20	20-40	40-80	>80	Total	<200	200-400	400-600	>600	Total	Grand Total
Sonipat	Voltage	5.00	3.22	0.00	2.50	2.93	1.50	2.25	1.60	2.50	2.04	2.39
	Frequency	0.00	1.00	0.00	1.25	0.93	0.00	1.13	1.20	1.00	0.91	0.92
	Scheduled	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	1.50	0.52	0.32
	Unscheduled	5.00	3.89	5.00	4.75	4.27	3.75	3.88	3.60	4.17	3.87	4.03
	Demand Cut/Peak Load Cut	0.00	1.44	0.00	1.25	1.20	2.00	3.63	3.60	2 50	3.04	2.32
	No Response to complaints	0.00	0.56	0.00	1.00	0.60	0.00	1.13	0.00	2.50	1.04	0.87
	Unofficial payments	1.00	0.56	0.00	1.25	0.73	0.00	0.25	0.00	0.17	0.13	0.37
	Difficult to get new connection	0.00	0.67	0.00	3.50	1.33	1.25	1.88	1.20	0.83	1.35	1.34
	Difficult to get add load	0.00	0.67	0.00	2.25	1.00	1.25	0.88	1.00	1.83	1.22	1.13
	Other (specify)	0.00	0.00	0.00	1.25	0.33	1.00	1.63	2.00	1 67	1.61	1.11
Gurgaon	Voltage	4.00	2.05	3.14	2.00	2.26	2.18	1.76	2 94	2 71	2.35	2.32
	Frequency	0.00	0.69	2.86	1.67	1.06	1.59	0.80	1.00	1 75	1.30	1.20
	Scheduled	0.00	0.23	0.71	0.00	0.26	0.64	0.64	0.82	0 67	0 68	0.52
	Unscheduled	3.50	3.69	3.29	3.50	3.61	3.41	3.92	3.82	4 08	3.82	3.74
	Demand Cut/Peak Load Cut	0.00	1.05	1.14	2.17	1.15	1.45	1.56	0.88	1 83	1 48	1.35
	No Response to complaints	4.50	1.56	0.71	2.67	1.69	1.23	0.88	0.88	1 54	1 15	1.35
	Unofficial payments	5.00	1.08	0.00	0.17	0.98	1.59	1.80	1.12	0.25	1.19	1.11
	Difficult to get new connection	0.00	0.26	1.43	2.50	0.65	0.68	0.52	0.41	0.54	0.55	0.58
	Difficult to get add load	2.50	0.38	1.43	2.50	0.83	0.77	0.40	0.35	0 58	0.53	0.65
	Other (specify)	2.50	0.64	2.86	5.00	1.48	1.45	0.92	0.76	1.13	1.08	1.23
Bhiwani	Voltage	2.67	1.36	0.00	2.40	1.89	1.86	0.83	3.50	2.38	2 04	1.96
	Frequency	0.00	0.73	0.00	0.00	0.30	0.29	0.00	0.75	2.00	0 84	0.56
	Scheduled	0.67	0.18	0.50	1.40	0.59	0.57	0.33	0.00	0 63	0 44	0.52
	Unscheduled	3.89	2.91	1.00	3.20	3.15	2.43	2.83	4.25	2 63	2.88	3.02
	Demand Cut/Peak Load Cut	2.89	1.27	2.00	3.20	2.22	2.14	2.83	1.50	2 50	2.32	2.27
	No Response to complaints	0.67	1.64	0.00	3.00	1.44	0.00	2.17	1.00	1.25	1.08	1.27
	Unofficial payments	0.89	0.00	2.50	1.40	0.74	0.29	1.33	0.00	0 88	0.68	0.71
	Difficult to get new connection	2.22	1.27	0.00	3.80	1.96	0.71	0.83	1.00	2.50	1 36	1.67
	Difficult to get add load	1.33	1.09	0.00	2.00	1.26	1.71	0.83	0.50	1 88	1.36	1.31
	Other (specify)	0.00	0.82	0.00	0.00	0.33	0.71	2.17	1.75	0 00	1.00	0.65
Rohtak	Voltage	3.20	2.29	1.50	3.50	2.86	2.20	4.00	4 00	3 42	3 30	3 09
	Frequency	0.00	1.00	1.50	0.38	0.59	0.80	2.50	0.00	2.08	1.70	1 16
	Scheduled	0.20	0.43	0.00	1.38	0.68	0.00	0.00	1.50	0 58	0.43	0.56
	Unscheduled	3.80	4.00	3.00	3.63	3.73	3.80	4.25	3 50	4.67	4 30	4.02
	Demand Cut/Peak Load Cut	0.00	2.86	0.00	2.50	1.82	3.40	2.75	3.50	3.92	3.57	2.71
	No Response to complaints	0.60	1.14	2.50	1.75	1.36	2.20	1.25	1.00	1 92	1.78	1.58
	Unofficial payments	1.00	0.86	0.00	1.00	0.86	0.60	2.00	1 00	1.33	1 26	1 07
	Difficult to get new connection	1.00	2.00	0.00	1.25	1.32	1.00	1.25	2.50	1.83	1.61	1.47
	Difficult to get add load	0.40	1.29	0.00	1.25	0.95	1.80	1.25	0.00	2 00	1 65	1.31
	Other (specify)	1.40	3.29	0.00	2.50	2.27	3.80	2.50	2.50	3 83	3.48	2.89

A5.2.4 Contd./-

A5.2.4 Continued

Circle	Problems	Sanctioned load (hp)					Contract demand (kVA)					
		0-20	20-40	40-80	>80	Total	<200	200-400	400-600	>600	Total	Grand Total
Hisar	Voltage	4 00	1.60	3.20	2.00	2.36	-	3.75	5.00	2.75	3.44	2.68
	Frequency	0.00	0 80	0 40	0.00	0.45	-	0.25	5.00	0.00	0.67	0.52
	Scheduled	0.00	0.60	0.00	0.00	0.27	-	0.50	0.00	0.75	0.56	0.35
	Unscheduled	3.67	3.90	4 60	3.25	3.91	-	5.00	5.00	2.50	3.89	3.90
	Demand Cut/Peak Load Cut	2.67	1.50	1.00	2.00	1.64	-	2.50	3.00	2.25	2.44	1.87
	No Response to complaints	1 00	1 80	2.00	1 00	1.59	-	2.00	5.00	2.00	2.33	1.81
	Unofficial payments	0.00	0 70	0.80	0.00	0.50	-	2.50	5.00	2.50	2.78	1.16
	Difficult to get new connection	3 00	1.70	3.00	1.25	2.09	-	4.75	5.00	4 00	4.44	2.77
	Difficult to get add load	1.67	1.30	2.00	0.00	1.27	-	3.25	5.00	3.25	3.44	1.90
	Other (specify)	1.67	0.90	1.40	0.00	0.95	-	0.00	5.00	0.00	0.56	0.84
All	Voltage	2.45	1.98	2.38	2.73	2.27	2.56	2.46	2.80	2.74	2.62	2.46
	Frequency	0.10	0.70	1.14	0.79	0.68	0.93	0.83	0.94	1.53	1.06	0.89
	Scheduled	0.40	0.47	0.57	0.54	0.49	0.71	0.36	0.42	0 75	0.58	0.54
	Unscheduled	3.43	3.56	3.30	3.75	3.54	3.51	4.06	3.86	3.60	3.75	3.65
	Demand Cut/Peak Load Cut	1.55	1.35	1.14	2.00	1.48	2.26	2.45	2.12	2.66	2.40	1.97
	No Response to complaints	1 10	1.61	1.24	1.54	1 46	1.25	0.99	0 92	1.56	1.21	1.32
	Unofficial payments	1.19	1.13	0.59	0.87	1.01	1.21	1.53	0.96	0.76	1 14	1.08
	Difficult to get new connection	1.55	1.26	1.38	2.56	1.59	0.98	1.73	1.42	1.45	1.39	1.48
	Difficult to get add load	0.88	1.10	1.24	2.06	1.28	1.04	1.30	1.20	1.44	1.25	1.26
	Other (specify)	2.55	2.36	2.68	4.62	2.89	2.13	3.16	2.62	2.89	2.70	2.79

A5.3 Magnitude of power problems in HT and LT industries in Karnataka – Average Score

Problems	HT	LT	All
Voltage problem	3.10[a]	2.07	2.50
Frequency	1.46	0.61	0.96
Scheduled cut	2.12	2.66	2.44
Unscheduled cuts	3.38	3.71	3.57
Demand Cut/Peak Load Cut	1.03	0.40	0.66
No Response to complaints	1.45	1.87	1.69
Unofficial payments	1.16	1.76	1.51
Difficult to get new connection	1.66	1.96	1.84
Difficult to get add load	1.71	1.99	1.88
Other (specify)	1.07	0.94	0.99

[a] Respondents were asked to list the problems they faced with the grid supply and then rate them from 1 to 5 as per the severity of the problem faced (5 depicting the most serious problem and 1 the least). A score of 0 was assigned to a problem if the respondent was not experiencing it.

A5.3.1 Magnitude of power problems by electrical Circles in Karnataka – Average Score

Problems	Circles								
	Bangalore	Tumkur	Mysore	Mangalore	Shimoga	Belgaum	Hubli	Munirabad	Total
Voltage	2.56	2.95	2.79	1.40	2.22	2.18	2.22	2.45	2.50
Frequency	0.94	1.14	1.17	1.10	0.78	1.12	0.53	1.23	0.96
Scheduled	2.38	2.91	2.23	2.35	2.89	3.18	2.22	2.50	2.44
Unscheduled	3.55	4.45	3.65	3.50	2.93	3.71	3.53	3.55	3.57
Demand Cut/Peak Load Cut	0.72	0.45	0.79	0.25	0.81	0.71	0.41	0.23	0.66
No Response to complaints	1.81	2.23	1.87	0.65	1.41	1.65	1.41	0.91	1.69
Unofficial payments	1.82	1.91	1.56	0.30	0.74	0.82	0.91	0.14	1.51
Difficult to get new connection	2.07	2.59	1.98	1.30	1.78	1.00	0.88	0.05	1.84
Difficult to get add load	2.13	2.23	1.77	1.30	1.81	2.12	0.97	0.05	1.88
Other (specify)	1.09	1.46	0.00	0.59	0.59	0.25	0.36	0.99	0.84

A5.3.2 Magnitude of power problems by sanctioned load in LT industries in Karnataka – Average Score

Problems	Sanctioned load (hp)				
	0-20	20-40	40-80	>80	Total
Voltage	1.87	1.76	2.24	2.17	2.07
Frequency	0.51	0.53	0.72	0.57	0.61
Scheduled	2.46	2.80	2.70	2.61	2.66
Unscheduled	3.64	4.02	3.72	3.53	3.71
Demand Cut/Peak Load Cut	0.08	0.29	0.42	0.59	0.40
No Response to complaints	2.21	2.00	1.66	1.87	1.87
Unofficial payments	1.87	1.59	2.02	1.54	1.76
Difficult to get new connection	2.28	1.90	2.15	1.67	1.96
Difficult to get add load	1.87	2.20	2.23	1.65	1.99
Other (specify)	0.69	1.08	1.23	0.63	0.94

A5.3.3 Magnitude of power problems by contract demand in HT industries in Karnataka– Average Score

Problems	Contract demand (kVA)				
	< 200	200 - 400	400 - 600	> 600	Total
Voltage	3.02	2.63	2.96	3.66	3.10
Frequency	1.46	1.08	1.44	1.85	1.46
Scheduled	2.84	2.05	1.80	1.78	2.12
Unscheduled	3.52	3.35	3.20	3.36	3.38
Demand Cut/Peak Load Cut	1.10	0.94	0.76	1.18	1.03
No Response to complaints	1.94	1.05	1.52	1.45	1.45
Unofficial payments	1.90	1.03	1.36	0.66	1.16
Difficult to get new connection	1.96	1.45	1.56	1.69	1.66
Difficult to get add load	2.14	1.40	1.68	1.72	1.71
Other (specify)	1.16	0.95	0.52	1.30	1.06

A5.3.4 Magnitude of power problems by electrical Circles stratified by load in Karnataka – Average Score

Circle	Problems	Sanctioned load (hp)					Contract demand (kVA)					
		0 - 20	20 - 40	40 - 80	> 80	Total	< 200	200 - 400	400 - 600	> 600	Total	Grand Total
Bangalore	Voltage	1.71	1.97	2.50	2.16	2.20	2.73	3.16	3.00	3.59	3.14	2.56
	Frequency	0.25	0.61	0.82	0.47	0.60	1.14	1.31	1.67	1.92	1.48	0.94
	Scheduled	2.71	2.61	2.63	2.65	2.64	2.95	1.72	1.08	1.49	1.97	2.38
	Unscheduled	3.67	4.06	3.71	3.39	3.66	3.46	3.50	3.00	3.32	3.38	3.55
	Demand Cut/Peak Load Cut	0.00	0.52	0.40	0.60	0.43	1.30	1.31	1.00	1.05	1.19	0.72
	No Response to complaints	2.00	2.21	1.76	1.95	1.93	2.03	1.13	1.50	1.65	1.61	1.81
	Unofficial payments	1.79	2.24	2.38	1.69	2.06	2.08	1.53	1.33	0.76	1.44	1.82
	Difficult to get new connection	2.42	2.18	2.33	1.76	2.13	2.14	2.09	1.33	1.95	1.98	2.07
	Difficult to get add load	1.92	2.36	2.61	1.61	2.16	2.22	2.00	1.42	2.22	2.08	2.13
	Other (specify)	0.54	1.21	1.13	0.65	0.91	1.30	1.78	0.42	1.65	1.45	1.15
Tumkur	Voltage	-	1.00	1 50	4.17	2.31	5.00	3.00	5.00	5.00	4.67	2.95
	Frequency	-	0.00	0.00	1.17	0.44	4.00	2.00	0.00	4.00	3.00	1.14
	Scheduled	-	2.67	4.50	3.17	3.31	1.50	0.00	3.00	2.50	1.83	2.91
	Unscheduled	-	4 67	5.00	4.67	4.75	3 00	3.00	3 00	5 00	3.67	4.45
	Demand Cut/Peak Load Cut	-	0.00	0 00	0.50	0.19	1.00	2.00	0.00	1.50	1.17	0.45
	No Response to complaints	-	1.17	2.25	3.83	2.44	1 00	1.00	3.00	2.00	1 67	2.23
	Unofficial payments	-	0.83	3 50	1.83	1.88	1.00	2.00	3.00	2.50	2.00	1.91
	Difficult to get new connection	-	2.50	3.50	1.17	2.25	2.50	3.00	3.00	5.00	3.50	2.59
	Difficult to get add load	-	2.50	2.25	1.17	1.94	2.50	0.00	3.00	5.00	3.00	2.23
	Other (specify)	-	0.83	1.25	1.50	1.19	0.00	0.00	0.00	2.50	0.83	1.09
Mysore	Voltage	3.20	2.00	1 44	3.00	2.26	2.50	2.10	4.50	3.77	3.21	2.79
	Frequency	1.60	1.75	0.44	0.00	0.83	0.00	1.00	2.50	1.69	1.45	1.17
	Scheduled	2.60	2.00	2.56	3.20	2.61	2.50	1.80	1.75	2.00	1.93	2.23
	Unscheduled	4.40	3.50	3.67	3.60	3.78	4.50	2.50	4.50	3.92	3.55	3.65
	Demand Cut/Peak Load Cut	0.00	0.00	0.00	1.20	0.26	1.50	1.00	0.75	1.46	1.21	0.79
	No Response to complaints	3.40	3.50	1.11	2.60	2.35	0.00	1.40	2.25	1.54	1.48	1.87
	Unofficial payments	3.60	2.25	1.00	3.20	2.26	0.00	1.10	3.00	0.46	1.00	1.56
	Difficult to get new connection	3.60	3.00	2.56	2.60	2.87	0.00	1.00	3.00	1.15	1.28	1.98
	Difficult to get add load	3.20	3.25	2.44	2.00	2.65	0.00	0.70	3.75	0.69	1.07	1.77

A5.3.4 Contd./-

A5.3.4 Continued

Circle	Problems	Sanctioned load (hp)					Contract demand (kVA)					
		0 - 20	20 - 40	40 - 80	> 80	Total	< 200	200 - 400	400 - 600	> 600	Total	Grand Total
	Other (specify)	2.80	2.50	2.67	2.00	2.52	0.00	0.50	1.25	0.62	0.62	1.46
Mangalore	Voltage	0.00	0.00	-	0.50	0.30	5.00	1.50	2.00	4.00	2.50	1.40
	Frequency	1.67	0.00	-	1.33	1.30	2.00	0.33	0.00	3.00	0.90	1.10
	Scheduled	1.00	2.00	-	2.00	1.70	4.50	2.50	4.00	2.00	3.00	2.35
	Unscheduled	1.67	2.00	-	3.50	2.80	4.50	4.33	5.00	2.00	4.20	3.50
	Demand Cut/Peak Load Cut	0.00	0.00	-	0.33	0.20	1.00	0.00	0.00	1.00	0.30	0.25
	No Response to complaints	0.67	0.00	-	0.50	0.50	1.50	0.67	0.00	1.00	0.80	0.65
	Unofficial payments	0.33	0.00	-	0.33	0.30	0.50	0.33	0.00	0.00	0.30	0.30
	Difficult to get new connection	1.67	5.00	-	1.33	1.80	0.00	0.83	0 00	3.00	0.80	1.30
	Difficult to get add load	1.67	5.00	-	1.50	1.90	0.00	0.83	0.00	2.00	0.70	1.30
	Other (specify)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0 00
Shimoga	Voltage	2.00	2.00	1.67	2.67	2.13	3.00	0.67	2.75	3.33	2.36	2.22
	Frequency	0.00	1.00	0.00	0.83	0.50	2.00	1.33	1 00	1 00	1.18	0.78
	Scheduled	3.00	3.67	3.50	2.83	3.25	2.00	2.67	2.75	1.67	2.36	2.89
	Unscheduled	5.00	2.67	2.00	3.67	2.94	4.00	2.00	3.50	2.67	2.91	2.93
	Demand Cut/Peak Load Cut	3.00	0.00	1.50	0.33	0.88	0.00	0.67	0.50	1.33	0.73	0.81
	No Response to complaints	4.00	1.00	1.83	1.33	1.63	3.00	0.33	1.50	0.67	1.09	1.41
	Unofficial payments	0.00	1.33	0.67	0.67	0.75	2.00	0.33	0.50	1.00	0.73	0.74
	Difficult to get new connection	0.00	2.67	1.17	2.17	1.75	2.00	0.33	2 00	3.00	1.82	1.78
	Difficult to get add load	0.00	2.33	1.00	2.83	1.88	2.00	0.33	1 75	3.00	1.73	1.81
	Other (specify)	0.00	0.00	1.33	0.00	0.50	0.00	0.00	0.75	1.67	0.73	0.59
Belgaum	Voltage	-	0.33	1.67	0.50	0.88	3.25	2.33	-	5.00	3.33	2.18
	Frequency	-	0.00	0.00	0.00	0.00	2.75	1.00	-	2.50	2.11	1.12
	Scheduled	-	4.33	3.67	3.00	3.75	2.50	2.67	-	3.00	2.67	3 18
	Unscheduled	-	4.33	5.00	4.00	4.50	2.75	3.33	-	3.00	3.00	3.71
	Demand Cut/Peak Load Cut	-	0.00	1.67	1.00	0.88	0.00	0.00	-	2.50	0.56	0.71
	No Response to complaints	-	1.67	0.33	2.00	1.25	3.00	0.00	-	3.00	2.00	1.65
	Unofficial payments	-	0.00	0.00	1.50	0.38	2.75	0.00	-	0.00	1.22	0.82
	Difficult to get new connection	-	0.00	1.67	0.00	0.63	2.25	0.67	-	0.50	1.33	1.00
	Difficult to get add load	-	3.00	0.33	1.50	1.63	3.75	2.33	-	0.50	2.56	2 12
	Other (specify)	-	0.00	0.00	0.00	0.00	2.50	0.00	-	0.00	1.11	0 59
Hubli	Voltage	2.20	1.75	1.33	2.00	1.79	4.50	2.71	-	2.25	2.85	2.22
	Frequency	0.20	0.00	0.33	1.00	0.37	3.00	0.43	-	0.25	0.77	0.53
	Scheduled	1.80	3.25	1.83	1.50	2.05	2.00	2.57	-	2.50	2.46	2.22
	Unscheduled	3.80	4.25	3.67	3.25	3.74	4.50	3.00	-	3.00	3.23	3.53
	Demand Cut/Peak Load Cut	0.00	0.00	0.00	0.75	0.16	0.00	0.71	-	1.25	0.77	0.41
	No Response to complaints	3.00	2.00	1.67	0.50	1.84	1.00	0.86	-	0.50	0.77	1 41
	Unofficial payments	2.20	0.50	1.50	0.50	1.26	1.00	0.14	-	0.50	0.38	0.91
	Difficult to get new connection	1.60	0.00	0.67	1.25	0.89	1.50	0.86	-	0.50	0.85	0 88
	Difficult to get add load	1.20	0.75	0.67	1.75	1.05	1.50	1.00	-	0.25	0.85	0.97
	Other (specify)	0.00	1.00	0.67	0.00	0.42	0.00	0.00	-	0.00	0.00	0.25
Munirabad	Voltage	3.00	2.20	3.00	0.00	2.09	-	3.00	0 67	4.00	2.82	2 45
	Frequency	0.00	0.20	3.00	0.00	0.91	-	1.33	0.67	2.20	1.55	1.23
	Scheduled	3.00	3.20	1.67	1.50	2.45	-	3.67	2.33	2.00	2.55	2 50
	Unscheduled	3.00	4.20	4.67	4.00	4.18	-	5.00	1.33	2.60	2 91	3.55
	Demand Cut/Peak Load Cut	0.00	0.00	0.00	0.00	0.00	-	0.00	0.67	0.60	0.45	0.23
	No Response to complaints	0.00	1.60	1.00	0.00	1.00	-	2.00	0 67	0.20	0.82	0.91

A5.3.4 Contd./

A5.3.4 Continued

Circle	Problems	Sanctioned load (hp)					Contract demand (kVA)					
		0 - 20	20 - 40	40 - 80	> 80	Total	< 200	200 - 400	400 - 600	> 600	Total	Grand Total
	Unofficial payments	0.00	0.00	0.33	0.00	0.09	-	0.33	0.33	0.00	0.18	0.14
	Difficult to get new connection	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.20	0.09	0.05
	Difficult to get add load	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.20	0.09	0.05
	Other (specify)	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	1.60	0.73	0.36
All	Voltage	1.87	1.76	2.24	2.17	2.07	3.02	2.63	2.96	3.66	3.10	2.50
	Frequency	0.51	0.53	0.72	0.57	0.61	1.46	1.08	1.44	1.85	1.46	0.96
	Scheduled	2.46	2.80	2.70	2.61	2.66	2.84	2.05	1.80	1.78	2.12	2.44
	Unscheduled	3.64	4 02	3.72	3.53	3.71	3.52	3.35	3.20	3.36	3.38	3.57
	Demand Cut/Peak Load Cut	0.08	0 29	0.42	0.59	0.40	1.10	0.94	0.76	1.18	1.03	0.66
	No Response to complaints	2.21	2.00	1.66	1.87	1.87	1.94	1.05	1.52	1.45	1 45	1.69
	Unofficial payments	1.87	1.59	2.02	1.54	1.76	1.90	1.03	1.36	0.66	1.16	1.51
	Difficult to get new connection	2.28	1.90	2.15	1.67	1.96	1.96	1.45	1.56	1 69	1.66	1.84
	Difficult to get add load	1.87	2.20	2.23	1.65	1.99	2.14	1.40	1.68	1.72	1.71	1.88
	Other (specify)	0.69	1.08	1.23	0.63	0.94	1.16	0.95	0.52	1.30	1.06	0.99

A5.4 Duration of each type of power cut in different electrical Circles in Haryana (hrs/day)

Circle	Type of cut	Statistics	HT	LT	Total
Ambala	Demand cut summers	N	13	19	32
		Mean	4.0	1.4	2.5
		Std. Deviation	2.2	1.5	2.2
		Median	4.0	1.0	3 0
		Maximum	7.0	3.5	7.0
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	13	19	32
		Mean	3.9	1.3	2.4
		Std. Deviation	2.3	1.5	2.2
		Median	3.0	1.0	2.5
		Maximum	7.0	3.5	7.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	13	19	32
		Mean	2.6	2.2	2.4
		Std. Deviation	2.3	1.2	1.7
		Median	2.0	2.0	2.0
		Maximum	8.0	4.0	8.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	13	19	32
		Mean	2.1	1.6	1.8
		Std. Deviation	2.6	1.0	1.8
		Median	1 0	1.0	1.0
		Maximum	8.0	4.0	8.0
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	13	19	32
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0

A5.4 Contd./-

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Maximum	0.0	0.0	0.0
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	13	19	32
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0.0	0.0	0.0
		Minimum	0.0	0.0	0.0
	Total outages summers	N	13	19	32
		Mean	6.6	3.6	4.8
		Std. Deviation	3.6	1.9	3.1
		Median	7.0	3.5	4.0
		Maximum	12.0	7.5	12.0
		Minimum	1.5	1.0	1.0
	Total outage winters	N	13	19	32
		Mean	6.0	2.9	4.2
		Std. Deviation	3.9	1 8	3.2
		Median	5.0	2.0	3.3
		Maximum	12.0	7.0	12.0
		Minimum	0.0	0 5	0.0
Yamuna Nagar	Demand cut summers	N	16	25	41
		Mean	1.9	0.3	0.9
		Std. Deviation	2.1	0.8	1.7
		Median	1.5	0.0	0.0
		Maximum	6.0	3.0	6.0
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	16	25	41
		Mean	2.0	0.3	0.9
		Std. Deviation	2.2	0.8	1.7
		Median	1.5	0.0	0.0
		Maximum	6.0	3.0	6.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	16	25	41
		Mean	2.2	1.9	2.0
		Std. Deviation	1.3	0.9	1.1
		Median	2.5	2.0	2.0
		Maximum	4.0	4.0	4.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	16	25	41
		Mean	1.4	1.4	1.4
		Std. Deviation	0.8	0.9	0.9
		Median	1.7	1.0	1.0
		Maximum	3.0	3.0	3.0
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	16	25	41
		Mean	0.2	0.4	0.3
		Std. Deviation	0.4	0.8	0.7
		Median	0.0	0.0	0.0

A5.4 Contd./-

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Maximum	1.0	3.0	3.0
		Minimum	0.0	0.0	0 0
	Scheduled cut winters	N	16	25	41
		Mean	0.2	0.2	0.2
		Std. Deviation	0.4	0.6	0.5
		Median	0.0	0.0	0.0
		Maximum	1.0	3.0	3 0
		Minimum	0.0	0.0	0.0
	Total outages summers	N	16	25	41
		Mean	4.3	2 6	3.3
		Std. Deviation	2.3	1.0	1.8
		Median	4.0	3.0	3.0
		Maximum	10.0	4.0	10.0
		Minimum	0.0	1.0	0.0
	Total outage winters	N	16	25	41
		Mean	3.5	1.9	2 5
		Std. Deviation	1.9	1.1	1.6
		Median	3.5	2.0	2.0
		Maximum	6.5	4.0	6.5
		Minimum	0.0	0.0	0.0
Karnal	Demand cut summers	N	36	35	71
		Mean	4.0	1.5	2.7
		Std. Deviation	2.1	1.9	2.4
		Median	4.0	0.0	3.0
		Maximum	7.0	6.0	7.0
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	36	35	71
		Mean	3.9	1.4	2.7
		Std. Deviation	2.1	1.8	2.3
		Median	4.0	0.0	3.0
		Maximum	7.0	6.0	7.0
		Minimum	0.0	0 0	0.0
	Unscheduled cut summers	N	36	35	71
		Mean	3.9	3.2	3 5
		Std. Deviation	2.4	1.3	2.0
		Median	3.0	3.0	3.0
		Maximum	10.0	8.0	10.0
		Minimum	0.0	1.0	0.0
	Unscheduled cut winters	N	36	35	71
		Mean	2.8	2.5	2.7
		Std. Deviation	2.0	1.5	1.8
		Median	2.0	2.0	2.0
		Maximum	10.0	8.0	10.0
		Minimum	0.0	0.5	0.0
	Scheduled cut summers	N	36	35	71
		Mean	0.3	0.0	0.2
		Std. Deviation	1.6	0.0	1.1
		Median	0.0	0.0	0.0

A5.4 Contd./-

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Maximum	9.0	0.0	9.0
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	36	35	71
		Mean	0.1	0.0	0.1
		Std. Deviation	0.8	0.0	0.6
		Median	0.0	0.0	0.0
		Maximum	5.0	0.0	5.0
		Minimum	0.0	0.0	0.0
	Total outages summers	N	36	35	71
		Mean	8.2	4.7	6.4
		Std. Deviation	3.7	2.2	3.5
		Median	8.0	4.0	7.0
		Maximum	16.0	9.0	16.0
		Minimum	1.5	1.0	1.0
	Total outage winters	N	36	35	71
		Mean	6.8	3.9	5.4
		Std. Deviation	2.9	2.1	3.0
		Median	7.0	3.0	6.0
		Maximum	14.0	8.0	14.0
		Minimum	1.0	0.5	0.5
Faridabad	Demand cut summers	N	64	37	101
		Mean	3.3	1.0	2.5
		Std. Deviation	2.1	1.6	2.2
		Median	4.0	0.0	3.0
		Maximum	8.0	6.0	8.0
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	64	37	101
		Mean	2.9	0.9	2.2
		Std. Deviation	1.9	1.6	2.0
		Median	3.0	0.0	3.0
		Maximum	7.0	6.0	7.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	64	37	101
		Mean	3.4	3.1	3.3
		Std. Deviation	1.8	1.7	1.8
		Median	3.0	3.0	3.0
		Maximum	10.0	8.0	10.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	64	37	101
		Mean	2.5	2.0	2.3
		Std. Deviation	1.7	1.5	1.7
		Median	2.0	2.0	2.0
		Maximum	10.0	8.0	10.0
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	64	37	101
		Mean	0.0	0.2	0.1
		Std. Deviation	0.3	0.7	0.5
		Median	0.0	0.0	0.0

A5.4 Contd./-

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Maximum	2.0	4.0	4.0
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	64	37	101
		Mean	0.0	0.1	0.1
		Std. Deviation	0.1	0.7	0.4
		Median	0.0	0 0	0.0
		Maximum	1.0	4.0	4.0
		Minimum	0.0	0 0	0.0
	Total outages summers	N	64	37	101
		Mean	7.0	4.3	6.0
		Std. Deviation	3.2	2.1	3.1
		Median	7.0	4.0	6.0
		Maximum	18.0	10.0	18.0
		Minimum	2.0	1.0	1.0
	Total outage winters	N	64	37	101
		Mean	5.7	3.1	4 7
		Std. Deviation	3.1	1.9	3.0
		Median	6.0	3.0	4 5
		Maximum	18.0	8.0	18.0
		Minimum	0.3	0.5	0.3
Sonipat	Demand cut summers	N	23	15	38
		Mean	3.4	1.2	2.5
		Std. Deviation	2.0	1.9	2.2
		Median	3.0	0.0	3.0
		Maximum	9.0	5.0	9.0
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	23	15	38
		Mean	3.1	1.1	2.3
		Std. Deviation	1.9	1.6	2.0
		Median	3.0	0.0	3.0
		Maximum	7.0	4.0	7.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	23	15	38
		Mean	4.2	3 2	3.8
		Std. Deviation	2.5	1.5	2.2
		Median	4.0	3.0	3.0
		Maximum	8.0	7.0	8.0
		Minimum	0.0	1.3	0.0
	Unscheduled cut winters	N	23	15	38
		Mean	2.5	2.1	2.4
		Std. Deviation	1.6	0.8	1.3
		Median	3.0	2.0	2.0
		Maximum	6.0	4.0	6.0
		Minimum	0.0	1.0	0.0
	Scheduled cut summers	N	23	15	38
		Mean	0.1	0.0	0.1
		Std. Deviation	0.5	0.0	0.4
		Median	0.0	0.0	0.0

A5.4 Contd./-

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Maximum	2.0	0.0	2.0
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	23	15	38
		Mean	0.1	0.0	0.1
		Std. Deviation	0.4	0.0	0.3
		Median	0.0	0.0	0.0
		Maximum	2.0	0.0	2.0
		Minimum	0.0	0.0	0.0
	Total outages summers	N	23	15	38
		Mean	7.7	4.4	6.4
		Std. Deviation	3.5	2.8	3.6
		Median	7.0	3.0	6.0
		Maximum	14.0	12.0	14.0
		Minimum	2.0	1.3	1.3
	Total outage winters	N	23	15	38
		Mean	5.7	3.2	4.7
		Std. Deviation	2.8	2.1	2.8
		Median	6.0	2.0	4.0
		Maximum	12.0	7.0	12.0
		Minimum	1.0	1.0	1.0
Gurgaon	Demand cut summers	N	88	54	142
		Mean	2.6	1.2	2.1
		Std. Deviation	1.8	1.5	1.8
		Median	3.0	0.0	3.0
		Maximum	8.0	4.0	8.0
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	88	54	142
		Mean	2.4	1.1	1.9
		Std. Deviation	1.7	1.5	1.7
		Median	3.0	0.0	2.5
		Maximum	8.0	4.0	8.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	88	54	142
		Mean	4.2	3.4	3.9
		Std. Deviation	2.2	1.5	2.0
		Median	4.0	3.0	4.0
		Maximum	10.0	8.0	10.0
		Minimum	0.0	0.5	0.0
	Unscheduled cut winters	N	88	54	142
		Mean	2.7	2.1	2.5
		Std. Deviation	1.6	1.3	1.5
		Median	3.0	2.0	2.0
		Maximum	8.0	6.0	8.0
		Minimum	0.0	0.0	0.0

A5.4 Contd./-

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
	Scheduled cut summers	N	88	54	142
		Mean	0.6	0.1	0.5
		Std. Deviation	1.6	0.7	1.4
		Median	0.0	0.0	0.0
		Maximum	8.0	4.0	8 0
		Minimum	0.0	0.0	0 0
	Scheduled cut winters	N	88	54	142
		Mean	0.5	0.1	0.4
		Std. Deviation	1.3	0.7	1.1
		Median	0.0	0.0	0.0
		Maximum	8.0	4.0	8.0
		Minimum	0.0	0.0	0.0
	Total outages summers	N	88	54	142
		Mean	8.0	4.7	6.8
		Std. Deviation	3.7	2.1	3.6
		Median	7.5	4.0	6 0
		Maximum	19.0	12.0	19 0
		Minimum	3.0	1.0	1.0
	Total outage winters	N	88	54	142
		Mean	5.7	3 4	4 8
		Std. Deviation	3.2	2.2	3.1
		Median	5.0	3.0	4.3
		Maximum	16.0	12.0	16.0
		Minimum	0.5	0.0	0.0
Bhiwani	Demand cut summers	N	25	27	52
		Mean	3.0	1.5	2.2
		Std. Deviation	2.6	1.7	2.3
		Median	4.0	1.0	2.0
		Maximum	7.5	4.5	7.5
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	25	27	52
		Mean	2.6	1.4	2.0
		Std. Deviation	2.1	1.6	1.9
		Median	3.0	1.0	2.0
		Maximum	5.0	5.0	5.0
		Minimum	0.0	0.0	0 0
	Unscheduled cut summers	N	25	27	52
		Mean	2.1	1.6	1.8
		Std. Deviation	1.8	1.0	1.4
		Median	2.0	1.0	1.8
		Maximum	7.0	4.0	7.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	25	27	52
		Mean	1.7	1.2	1.4
		Std. Deviation	1.3	0.8	1.1
		Median	2.0	1.0	1.0
		Maximum	5.0	3.0	5.0

A5.4 Contd./-

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	25	27	52
		Mean	0.2	0.1	0.2
		Std. Deviation	0.8	0.3	0.6
		Median	0.0	0.0	0.0
		Maximum	4.0	1.0	4.0
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	25	27	52
		Mean	0.2	0.1	0.1
		Std. Deviation	0.6	0.3	0.5
		Median	0.0	0.0	0.0
		Maximum	3.0	1.0	3.0
		Minimum	0.0	0.0	0.0
	Total outages summers	N	25	27	52
		Mean	5.3	3.2	4.2
		Std. Deviation	3.9	1.9	3.2
		Median	5.0	2.5	4.0
		Maximum	16.0	7.0	16.0
		Minimum	0.0	0.5	0.0
	Total outage winters	N	25	27	52
		Mean	4.4	2.7	3.5
		Std. Deviation	2.9	1.6	2.5
		Median	4.0	2.5	3.0
		Maximum	13.0	5.5	13.0
		Minimum	0.0	0.5	0.0
Rohtak	Demand cut summers	N	23	22	45
		Mean	4.1	1.6	2.9
		Std. Deviation	1.8	2.0	2.3
		Median	4.0	0.8	3.0
		Maximum	7.0	6.0	7.0
		Minimum	0.0	0 0	0.0
	Demand cut winters	N	23	22	45
		Mean	5.2	1.9	3.6
		Std. Deviation	1.9	2.5	2.7
		Median	6.0	0.8	3.5
		Maximum	7.0	7.0	7.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	23	22	45
		Mean	3.9	2.5	3.2
		Std. Deviation	2.9	1.3	2.4
		Median	3.0	2.0	2.0
		Maximum	10.0	6 0	10.0
		Minimum	0.0	0.5	0.0
	Unscheduled cut winters	N	23	22	45
		Mean	2.7	2.0	2.3
		Std. Deviation	2.4	1.3	1.9
		Median	2.0	1.8	2.0

A5.4 Contd./-

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Maximum	10.0	5.0	10.0
		Minimum	0.0	0.5	0.0
	Scheduled cut summers	N	23	22	45
		Mean	0.1	0.0	0.1
		Std. Deviation	0.6	0.0	0.4
		Median	0.0	0.0	0.0
		Maximum	3.0	0.0	3.0
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	23	22	45
		Mean	0.1	0.0	0.1
		Std. Deviation	0.6	0.0	0.4
		Median	0.0	0.0	0.0
		Maximum	3.0	0.0	3.0
		Minimum	0.0	0.0	0.0
	Total outages summers	N	23	22	45
		Mean	8.6	4.1	6.4
		Std. Deviation	3.9	2.5	4.0
		Median	8.0	4.0	6.0
		Maximum	18.0	10.0	18.0
		Minimum	2.0	1.0	1.0
	Total outage winters	N	23	22	45
		Mean	8.5	3.9	6.3
		Std. Deviation	3.6	3.2	4.1
		Median	9.0	3.0	6.0
		Maximum	18.0	12.0	18.0
		Minimum	2.0	0.5	0.5
Hisar	Demand cut summers	N	9	22	31
		Mean	4.5	1.0	2.0
		Std. Deviation	2.3	1.8	2.5
		Median	4.0	0.0	1.0
		Maximum	7.0	6.0	7.0
		Minimum	0.0	0.0	0 0
	Demand cut winters	N	9	22	31
		Mean	3.8	0.9	1 7
		Std. Deviation	1.8	1.5	2.1
		Median	4.0	0.0	1.0
		Maximum	6.0	5.0	6.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	9	22	31
		Mean	3.1	2.6	2.8
		Std. Deviation	1.3	1.4	1.4
		Median	3.0	2.5	2.5
		Maximum	5.0	6.0	6.0
		Minimum	2.0	1.0	1.0
	Unscheduled cut winters	N	9	22	31
		Mean	2.4	2.0	2.1
		Std. Deviation	1.5	1.4	1.4
		Median	3.0	2.0	2.0

A5.4 Contd./-

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Maximum	5.0	6.0	6.0
		Minimum	1.0	0.0	0.0
	Scheduled cut summers	N	9	22	31
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0.0	0.0	0.0
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	9	22	31
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0.0	0.0	0.0
		Minimum	0.0	0.0	0.0
	Total outages summers	N	9	22	31
		Mean	7.6	3.6	4.8
		Std. Deviation	2 8	3.0	3.4
		Median	8.5	3.0	3.5
		Maximum	10.0	12.0	12.0
		Minimum	2.0	1 0	1.0
	Total outage winters	N	9	22	31
		Mean	6.3	2.9	3.9
		Std. Deviation	3.0	2.8	3.2
		Median	7.5	2.0	2.5
		Maximum	11.0	11.0	11.0
		Minimum	1.0	0.5	0.5
Total	Demand cut summers	N	297	256	553
		Mean	3.2	1.2	2.3
		Std. Deviation	2.1	1.7	2.2
		Median	3.5	0.0	3.0
		Maximum	9.0	6.0	9.0
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	297	256	553
		Mean	3.1	1.1	2.2
		Std. Deviation	2.1	1.7	2.1
		Median	3.0	0.0	2.5
		Maximum	8.0	7.0	8.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	297	256	553
		Mean	3.6	2.7	3.2
		Std. Deviation	2.2	1.5	2.0
		Median	3.0	2.8	3.0
		Maximum	10.0	8.0	10.0
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	297	256	553
		Mean	2 5	1.9	2.2
		Std. Deviation	1.8	1.3	1.6
		Median	2.0	2.0	2.0

A5.4 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Maximum	10.0	8 0	10.0
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	297	256	553
		Mean	0.3	0.1	0 2
		Std. Deviation	1.1	0 5	0 9
		Median	0.0	0.0	0 0
		Maximum	9.0	4 0	9 0
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	297	256	553
		Mean	0.2	0.1	0.1
		Std. Deviation	0.8	0.5	0.7
		Median	0.0	0.0	0.0
		Maximum	8.0	4.0	8.0
		Minimum	0.0	0.0	0.0
	Total outages summers	N	297	256	553
		Mean	7.3	4.0	5.8
		Std. Deviation	3.7	2.2	3 5
		Median	7.0	4.0	5.0
		Maximum	19.0	12.0	19.0
		Minimum	0.0	0.5	0.0
	Total outage winters	N	297	256	553
		Mean	5.9	3.1	4.6
		Std. Deviation	3.2	2.2	3.1
		Median	6.0	3.0	4 0
		Maximum	18.0	12.0	18.0
		Minimum	0.0	0.0	0.0

A5.4.1 Duration of each type of power cut, classified according to various shifts in captive and non-captive units in Haryana (hrs/day)

Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
1	Grid Only	N	49	49	49	49	49	49	49	49
		Mean	0.3	0.3	2.4	1.7	0.1	0.0	2.8	1.9
		Std. Deviation	1.0	1.0	1.2	1.1	0.3	0.1	1.5	1.6
		Median	0.0	0.0	2.0	1.5	0.0	0.0	2.5	2.0
		Maximum	6.0	6.0	6.0	4.0	2.0	0.5	9.0	9.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
	Captive & Grid	N	166	166	166	166	166	166	166	166
		Mean	0.4	0.4	2.8	2.0	0.1	0.1	3 4	2.4
		Std. Deviation	1.0	0.9	1.3	1.1	0.5	0.4	1.8	1.4
		Median	0.0	0.0	3.0	2.0	0.0	0.0	3.0	2.0
		Maximum	4.0	6.0	8.0	5.0	4.0	4.0	16 0	12.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	All together	N	215	215	215	215	215	215	215	215
		Mean	0.4	0.4	2.7	1.9	0.1	0.1	3.2	2.3
		Std. Deviation	1.0	0.9	1.3	1.1	0.5	0.4	1.7	1 5
		Median	0.0	0.0	3.0	2.0	0.0	0.0	3.0	2.0
		Maximum	6.0	6.0	8.0	5.0	4.0	4.0	16.0	12.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0 0	0.0
2	Grid Only	N	21	21	21	21	21	21	21	21
		Mean	2.0	2.1	2.0	1.1	0.2	0.2	4.1	3.4
		Std. Deviation	1.8	1.9	1.3	0.8	0.7	0.7	2.4	2.2
		Median	3.0	3.0	2.0	1.0	0.0	0.0	4 0	3.5
		Maximum	6.0	6.0	5.0	3.0	3.0	3.0	9.0	9.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Captive & Grid	N	146	146	146	146	146	146	146	146
		Mean	2.8	2.6	3.0	2.1	0.2	0.2	5.9	4.9
		Std. Deviation	1.8	1.7	1.7	1.4	0.7	0 7	2 4	2.3
		Median	3.0	3.0	3.0	2.0	0.0	0.0	6 0	5 0
		Maximum	9.0	7.0	10.0	8.0	5.0	5.0	13 0	12.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
	All together	N	167	167	167	167	167	167	167	167
		Mean	2.7	2.6	2.9	2.0	0.2	0.2	5.7	4 7
		Std. Deviation	1.9	1.8	1.7	1.4	0.7	0.7	2 4	2.3
		Median	3.0	3.0	3.0	2.0	0.0	0.0	6 0	5.0
		Maximum	9.0	7.0	10.0	8.0	5.0	5.0	13.0	12.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0 0
3	Grid Only	N	7	7	7	7	7	7	7	7
		Mean	2.7	2.6	4.2	3.2	0.0	0.0	6.9	5.8
		Std. Deviation	1.3	2.1	2.6	2.9	0.0	0.0	3.0	3 2
		Median	3.0	3.0	4.0	2.0	0.0	0.0	6.0	4 0
		Maximum	4.0	6.0	8.0	8.0	0.0	0.0	11.0	11.0

A5.4.1 Contd./

A5.4.1 Continued

Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
		Minimum	0.0	0.0	0.5	0.5	0.0	0.0	3.5	2.0
	Captive & Grid	N	164	164	164	164	164	164	164	164
		Mean	4.3	4.1	4.0	2.8	0.4	0.3	9.2	7.4
		Std. Deviation	1.4	1.5	2.5	2.0	1.4	1.0	3.3	3.0
		Median	4 0	4 0	4.0	3.0	0.0	0.0	9.0	7.0
		Maximum	8.0	8.0	10.0	10.0	9.0	8.0	19.0	18.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	3.0	1.0
	All together	N	171	171	171	171	171	171	171	171
		Mean	4.3	4.0	4.0	2.8	0.4	0.2	9.1	7.3
		Std. Deviation	1.4	1.6	2.5	2.1	1.3	0.9	3.3	3.0
		Median	4.0	4.0	4.0	3.0	0.0	0.0	9.0	7.0
		Maximum	8.0	8.0	10.0	10.0	9.0	8.0	19.0	18.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	3.0	1.0
All	Grid Only	N	77	77	77	77	77	77	77	77
		Mean	1 0	1.0	2.4	1.6	0.1	0.1	3.5	2 7
		Std. Deviation	1.6	1.7	1.5	1.4	0.4	0.4	2.3	2.2
		Median	0.0	0.0	2.0	1.0	0.0	0.0	3.0	2.0
		Maximum	6.0	6.0	8.0	8.0	3.0	3.0	11.0	11.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Captive & Grid	N	476	476	476	476	476	476	476	476
		Mean	2.5	2.4	3.3	2.3	0.2	0.2	6.2	4.9
		Std. Deviation	2.2	2.1	2.0	1.6	0.9	0.7	3.5	3.1
		Median	3.0	3.0	3.0	2.0	0.0	0.0	6.0	4.5
		Maximum	9.0	8.0	10.0	10.0	9.0	8.0	19.0	18.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	All together	N	553	553	553	553	553	553	553	553
		Mean	2.3	2.2	3.2	2.2	0.2	0.1	5.8	4.6
		Std. Deviation	2.2	2.1	2.0	1.6	0.9	0.7	3.5	3.1
		Median	3.0	2.5	3.0	2.0	0.0	0.0	5.0	4.0
		Maximum	9.0	8.0	10.0	10.0	9.0	8.0	19.0	18.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

A5.4.2 Duration of each type of power cut, classified according to various shifts in captive and non-captive units by industrial category in Haryana (hrs./day)

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total win
HT	1	Grid Only	N	3	3	3	3	3	3	3	
			Mean	3.0	3.0	2.2	1.7	0.0	0.0	5.2	
			Std. Deviation	3.0	3.0	0.8	1.5	0.0	0.0	3.8	
			Median	3.0	3.0	2.0	2.0	0.0	0.0	5.0	
			Maximum	6.0	6.0	3.0	3.0	0.0	0.0	9.0	
			Minimum	0.0	0.0	1.5	0.0	0.0	0.0	1.5	
		Captive & Grid	N	60	60	60	60	60	60	60	
			Mean	0.5	0.5	3.0	2.1	0.2	0.1	3.6	
			Std. Deviation	1.1	1.1	1.5	1.1	0.7	0.5	2.2	
			Median	0.0	0.0	3.0	2.0	0.0	0.0	3.0	
			Maximum	4.0	6.0	8.0	5.0	4.0	4.0	16.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		All together	N	63	63	63	63	63	63	63	
			Mean	0.6	0.6	2.9	2.1	0.1	0.1	3.7	
			Std. Deviation	1.3	1.3	1.5	1.1	0.6	0.5	2.3	
			Median	0.0	0.0	3.0	2.0	0.0	0.0	3.0	
			Maximum	6.0	6.0	8.0	5.0	4.0	4.0	16.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	2	Grid Only	N	2	2	2	2	2	2	2	
			Mean	0.0	0.0	2.0	0.7	0.0	0.0	2.0	
			Std. Deviation	0.0	0.0	2.8	0.9	0.0	0.0	2.8	
			Median	0.0	0.0	2.0	0.7	0.0	0.0	2.0	
			Maximum	0.0	0.0	4.0	1.3	0.0	0.0	4.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		Captive & Grid	N	83	83	83	83	83	83	83	
			Mean	3.3	3.1	3.1	2.1	0.2	0.2	6.6	
			Std. Deviation	1.9	1.7	1.7	1.4	0.8	0.7	2.4	
			Median	3.0	3.0	3.0	2.0	0.0	0.0	7.0	
			Maximum	9.0	7.0	10.0	8.0	5.0	5.0	13.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.5	
		All together	N	85	85	85	85	85	85	85	
			Mean	3.2	3.0	3.1	2.1	0.2	0.2	6.5	
			Std. Deviation	1.9	1.8	1.7	1.4	0.7	0.7	2.4	
			Median	3.0	3.0	3.0	2.0	0.0	0.0	7.0	
			Maximum	9.0	7.0	10.0	8.0	5.0	5.0	13.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	3	Grid Only	N	4	4	4	4	4	4	4	
			Mean	2.3	3.0	4.6	4.6	0.0	0.0	6.9	
			Std. Deviation	1.5	2.4	3.2	3.2	0.0	0.0	3.7	
			Median	3.0	3.0	5.0	5.0	0.0	0.0	6.5	
			Maximum	3.0	6.0	8.0	8.0	0.0	0.0	11.0	
			Minimum	0.0	0.0	0.5	0.5	0.0	0.0	3.5	

A5.4.2 Contd./-

A5.4.2 Continued

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
		Captive & Grid	N	145	145	145	145	145	145	145	145
			Mean	4.4	4.2	4.1	2.8	0.4	0.3	9.4	7.5
			Std. Deviation	1.4	1.5	2.6	2.0	1.4	1.0	3.3	3.0
			Median	4.0	4.0	4.0	3.0	0.0	0.0	9.0	7.0
			Maximum	8.0	8.0	10.0	10.0	9.0	8.0	19.0	18.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	3.0	1.0
		All together	N	149	149	149	149	149	149	149	149
			Mean	4 3	4.1	4.1	2.8	0.4	0.3	9.3	7.5
			Std. Deviation	1.4	1.5	2.6	2.1	1.4	1.0	3.3	3.0
			Median	4.0	4.0	4.0	3.0	0.0	0.0	9.0	7.0
			Maximum	8.0	8.0	10.0	10.0	9.0	8.0	19.0	18.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	3.0	1.0
	Total	Grid Only	N	9	9	9	9	9	9	9	9
			Mean	2.0	2.3	3.2	2.8	0.0	0.0	5.2	5.1
			Std. Deviation	2.1	2.5	2.6	2.8	0.0	0.0	3.7	4.1
			Median	3.0	3.0	3.0	2.0	0.0	0.0	4.0	5.0
			Maximum	6.0	6.0	8.0	8.0	0.0	0.0	11.0	11.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	288	288	288	288	288	288	288	288
			Mean	3.3	3.1	3.6	2.5	0.3	0.2	7.4	5.9
			Std. Deviation	2.1	2.1	2.2	1.7	1.1	0.9	3.7	3.2
			Median	3.8	3.0	3.0	2.0	0.0	0.0	7.0	6.0
			Maximum	9.0	8.0	10.0	10.0	9.0	8.0	19.0	18.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	297	297	297	297	297	297	297	297
			Mean	3.2	3.1	3.6	2.5	0.3	0.2	7.3	5.9
			Std. Deviation	2.1	2.1	2.2	1.8	1.1	0.8	3.7	3.2
			Median	3.5	3.0	3.0	2.0	0.0	0.0	7.0	6.0
			Maximum	9.0	8.0	10.0	10.0	9.0	8.0	19.0	18.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LT	1	Grid Only	N	46	46	46	46	46	46	46	46
			Mean	0.1	0.1	2.4	1.7	0.1	0.0	2.6	1.8
			Std. Deviation	0.5	0.4	1.3	1.1	0.3	0.1	1.2	1.1
			Median	0.0	0.0	2.0	1.5	0.0	0.0	2.3	2.0
			Maximum	2.0	2.0	6.0	4 0	2.0	0.5	6.0	4.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
		Captive & Grid	N	106	106	106	106	106	106	106	106
			Mean	0.4	0.3	2.8	2.0	0.1	0.1	3.2	2.3
			Std. Deviation	0.9	0.8	1.2	1.1	0.4	0.3	1.4	1.3
			Median	0.0	0.0	3.0	2.0	0.0	0.0	3.0	2.0
			Maximum	4.0	4.0	6.0	5.0	2.0	2.0	8.0	7.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
		All together	N	152	152	152	152	152	152	152	152
			Mean	0.3	0.3	2.7	1.9	0.1	0.0	3.0	2.2
			Std. Deviation	0.8	0.7	1.3	1.1	0.4	0.2	1.4	1.3
			Median	0.0	0.0	3.0	2.0	0.0	0.0	3.0	2.0
			Maximum	4.0	4.0	6.0	5.0	2.0	2.0	8.0	7.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0

A5.4.2 Contd./-

A5.4.2 Continued

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total
	2	Grid Only	N	19	19	19	19	19	[illegible]	[illegible]	
			Mean	2.2	2.3	1.9	1.2	0.2	0.2	4.4	
			Std. Deviation	1.8	1.9	1.2	0.8	0.7	0.7	2.3	
			Median	3.0	3.0	2.0	1.0	0.0	0.0	4.0	
			Maximum	6.0	6.0	5.0	3.0	3.0	3.0	9.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	
		Captive & Grid	N	63	63	63	63	63	63	63	
			Mean	2.1	2.0	2.8	2.1	0.1	0.1	5.0	
			Std. Deviation	1.6	1.6	1.7	1.5	0.7	0.7	2.0	
			Median	3.0	2.0	2.0	2.0	0.0	0.0	5.0	
			Maximum	6.0	6.0	8.0	8.0	4.0	4.0	12.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	
		All together	N	82	82	82	82	82	82	82	
			Mean	2.1	2.1	2.6	1.9	0.2	0.2	4.9	
			Std. Deviation	1.6	1.7	1.6	1.4	0.7	0.7	2.1	
			Median	3.0	2.8	2.0	2.0	0.0	0.0	5.0	
			Maximum	6.0	6.0	8.0	8.0	4.0	4.0	12.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	
	3	Grid Only	N	3	3	3	3	3	3	3	
			Mean	3.3	2.0	3.7	1.3	0.0	0.0	7.0	
			Std. Deviation	0.6	1.7	2.1	0.6	0.0	0.0	2.6	
			Median	3.0	3.0	3.0	1.0	0.0	0.0	6.0	
			Maximum	4.0	3.0	6.0	2.0	0.0	0.0	10.0	
			Minimum	3.0	0.0	2.0	1.0	0.0	0.0	5.0	
		Captive & Grid	N	19	19	19	19	19	19	19	
			Mean	4.1	3.8	3.5	2.8	0.1	0.1	7.7	
			Std. Deviation	1.5	1.9	2.1	2.2	0.3	0.3	2.5	
			Median	4.0	3.0	3.0	2.0	0.0	0.0	7.0	
			Maximum	6.0	7.0	8.0	8.0	1.0	1.0	12.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	3.0	
		All together	N	22	22	22	22	22	22	22	
			Mean	4.0	3.5	3.5	2.6	0.1	0.1	7.6	
			Std. Deviation	1.5	2.0	2.1	2.1	0.2	0.2	2.5	
			Median	4.0	3.0	3.0	2.0	0.0	0.0	7.0	
			Maximum	6.0	7.0	8.0	8.0	1.0	1.0	12.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	3.0	
	Total	Grid Only	N	68	68	68	68	68	68	68	
			Mean	0.9	0.8	2.3	1.5	0.1	0.1	3.3	
			Std. Deviation	1.5	1.5	1.3	1.0	0.5	0.4	2.0	
			Median	0.0	0.0	2.0	1.0	0.0	0.0	3.0	
			Maximum	6.0	6.0	6.0	4.0	3.0	3.0	10.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	
		Captive & Grid	N	188	188	188	188	188	188	188	
			Mean	1.3	1.2	2.9	2.1	0.1	0.1	4.3	
			Std. Deviation	1.7	1.7	1.5	1.4	0.5	0.5	2.3	
			Median	0.0	0.0	3.0	2.0	0.0	0.0	4.0	
			Maximum	6.0	7.0	8.0	8.0	4.0	4.0	12.0	
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.5	

A5.4.2 Contd./-

A5.4.2 Continued

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
		All together	N	256	256	256	256	256	256	256	256
			Mean	1.2	1.1	2.7	1.9	0.1	0.1	4.0	3.1
			Std. Deviation	1.7	1.7	1.5	1.3	0.5	0.5	2.2	2.2
			Median	0.0	0.0	2.8	2.0	0.0	0.0	4.0	3.0
			Maximum	6.0	7.0	8.0	8.0	4.0	4 0	12.0	12.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Total	1	Grid Only	N	49	49	49	49	49	49	49	49
			Mean	0 3	0.3	2.4	1.7	0.1	0.0	2.8	1.9
			Std. Deviation	1.0	1.0	1.2	1.1	0.3	0.1	1.5	1.6
			Median	0.0	0.0	2.0	1.5	0.0	0.0	2.5	2.0
			Maximum	6.0	6.0	6.0	4.0	2.0	0.5	9.0	9.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
		Captive & Grid	N	166	166	166	166	166	166	166	166
			Mean	0.4	0.4	2.8	2.0	0.1	0.1	3.4	2.4
			Std. Deviation	1.0	0.9	1.3	1.1	0.5	0.4	1.8	1.4
			Median	0.0	0.0	3.0	2.0	0.0	0.0	3.0	2.0
			Maximum	4.0	6.0	8.0	5.0	4.0	4.0	16.0	12.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	215	215	215	215	215	215	215	215
			Mean	0.4	0.4	2.7	1.9	0.1	0.1	3.2	2.3
			Std. Deviation	1.0	0.9	1.3	1.1	0.5	0.4	1.7	1.5
			Median	0.0	0.0	3.0	2.0	0.0	0.0	3.0	2.0
			Maximum	6.0	6.0	8.0	5.0	4.0	4.0	16.0	12.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Grid Only	N	21	21	21	21	21	21	21	21
			Mean	2.0	2.1	2.0	1.1	0.2	0.2	4.1	3.4
			Std. Deviation	1.8	1.9	1.3	0.8	0.7	0.7	2.4	2.2
			Median	3.0	3.0	2.0	1.0	0.0	0.0	4.0	3.5
			Maximum	6.0	6.0	5.0	3.0	3.0	3.0	9.0	9.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	146	146	146	146	146	146	146	146
			Mean	2.8	2.6	3.0	2.1	0.2	0.2	5.9	4.9
			Std. Deviation	1.8	1.7	1.7	1.4	0.7	0.7	2.4	2.3
			Median	3.0	3.0	3.0	2.0	0.0	0.0	6.0	5.0
			Maximum	9.0	7.0	10.0	8.0	5.0	5.0	13.0	12.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
		All together	N	167	167	167	167	167	167	167	167
			Mean	2.7	2.6	2.9	2.0	0.2	0.2	5.7	4.7
			Std. Deviation	1.9	1.8	1.7	1.4	0.7	0.7	2.4	2.3
			Median	3.0	3.0	3.0	2.0	0.0	0.0	6.0	5.0
			Maximum	9.0	7.0	10.0	8.0	5.0	5.0	13.0	12.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Grid Only	N	7	7	7	7	7	7	7	7
			Mean	2.7	2.6	4.2	3.2	0.0	0.0	6.9	5.8
			Std. Deviation	1.3	2.1	2.6	2.9	0.0	0.0	3.0	3.2
			Median	3.0	3.0	4.0	2.0	0.0	0.0	6.0	4.0
			Maximum	4.0	6.0	8.0	8.0	0.0	0.0	11.0	11.0

A5.4.2 Contd./-

A5.4.2 Continued

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers
			Minimum	0.0	0.0	0.5	0.5	0.0	0.0	3.5
		Captive & Grid	N	164	164	164	164	164	164	164
			Mean	4.3	4.1	4.0	2.8	0.4	0.3	9.2
			Std. Deviation	1.4	1.5	2.5	2.0	1.4	1.0	3.3
			Median	4.0	4.0	4.0	3.0	0.0	0.0	9.0
			Maximum	8.0	8.0	10.0	10.0	9.0	8.0	19.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	3.0
		All together	N	171	171	171	171	171	171	171
			Mean	4.3	4.0	4.0	2.8	0.4	0.2	9.1
			Std. Deviation	1.4	1.6	2.5	2.1	1.3	0.9	3.3
			Median	4.0	4.0	4.0	3.0	0.0	0.0	9.0
			Maximum	8.0	8.0	10.0	10.0	9.0	8.0	19.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	3.0
	Total	Grid Only	N	77	77	77	77	77	77	77
			Mean	1.0	1.0	2.4	1.6	0.1	0.1	3.5
			Std. Deviation	1.6	1.7	1.5	1.4	0.4	0.4	2.3
			Median	0.0	0.0	2.0	1.0	0.0	0.0	3.0
			Maximum	6.0	6.0	8.0	8.0	3.0	3.0	11.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	476	476	476	476	476	476	476
			Mean	2.5	2.4	3.3	2.3	0.2	0.2	6.2
			Std. Deviation	2.2	2.1	2.0	1.6	0.9	0.7	3.5
			Median	3.0	3.0	3.0	2.0	0.0	0.0	6.0
			Maximum	9.0	8.0	10.0	10.0	9.0	8.0	19.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	553	553	553	553	553	553	553
			Mean	2.3	2.2	3.2	2.2	0.2	0.1	5.8
			Std. Deviation	2.2	2.1	2.0	1.6	0.9	0.7	3.5
			Median	3.0	2.5	3.0	2.0	0.0	0.0	5.0
			Maximum	9.0	8.0	10.0	10.0	9.0	8.0	19.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0

A5.5 Duration of each type of power cut in different Circles in Karnataka (hrs./day)

Circle	Type of cut	Statistics	HT	LT	Total
Bangalore	Demand cut summers	N	118	191	309
		Mean	0.6	0.2	0.3
		Std. Deviation	1.2	0.6	0.9
		Median	0.0	0.0	0.0
		Maximum	6	4	6
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	118	191	309
		Mean	0.1	0.0	0.1
		Std. Deviation	0.6	0.1	0.4
		Median	0.0	0.0	0.0
		Maximum	4	1	4
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	118	191	309
		Mean	1.8	1.7	1.8
		Std. Deviation	1.6	1.4	1.4
		Median	1.8	1.5	1.6
		Maximum	8	8	8
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	118	191	309
		Mean	0.7	0.5	0.5
		Std. Deviation	0.9	0.7	0.8
		Median	0.1	0.0	0.0
		Maximum	5	4	5
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	118	191	309
		Mean	1.8	2.2	2.0
		Std. Deviation	1.7	1.6	1.6
		Median	2.0	2.0	2.0
		Maximum	6.5	6.9	6.9
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	118	191	309
		Mean	0.3	0.1	0.2
		Std. Deviation	0.8	0.4	0.6
		Median	0.0	0.0	0.0
		Maximum	4	2	4
		Minimum	0.0	0.0	0.0
	Total outage summers	N	118	191	309
		Mean	4.3	4.0	4.1
		Std. Deviation	2.8	2.1	2.4
		Median	4.0	4.0	4.0
		Maximum	12	11	12
		Minimum	0.0	0.0	0.0
	Total outage winters	N	118	191	309
		Mean	1.1	0.6	0.8
		Std. Deviation	1.6	0.8	1.2
		Median	0.5	0.0	0.0
		Maximum	9	4	9

A5.5 Contd./-

A5.5 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Minimum	0.0	0.0	0.0
Tumkur	Demand cut summers	N	6	16	22
		Mean	1.2	0.1	0.4
		Std. Deviation	1.4	0.4	0.9
		Median	0.9	0.0	0.0
		Maximum	3.0	1.4	3.0
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	6	16	22
		Mean	0.2	0.0	0.0
		Std. Deviation	0.4	0.0	0.2
		Median	0.0	0.0	0.0
		Maximum	1	0	1
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	6	16	22
		Mean	2.3	2.7	2.6
		Std. Deviation	2.2	2.1	2.1
		Median	2.3	2.3	2.3
		Maximum	5	6	6
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	6	16	22
		Mean	0.5	1.2	1.0
		Std. Deviation	0.6	1.1	1.0
		Median	0.3	1.0	1.0
		Maximum	1.5	4	4
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	6	16	22
		Mean	3.1	2.2	2.4
		Std. Deviation	2.1	1.6	1.8
		Median	4.0	2.4	2.9
		Maximum	5.3	4.4	5.3
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	6	16	22
		Mean	0.6	0.1	0.2
		Std. Deviation	0.9	0.3	0.5
		Median	0.0	0.0	0.0
		Maximum	2	1	2
		Minimum	0.0	0.0	0.0
	Total outage summers	N	6	16	22
		Mean	6.7	4.9	5.4
		Std. Deviation	1.9	2.0	2.1
		Median	7.0	5.0	5.0
		Maximum	9	8	9
		Minimum	4.0	0.0	0.0
	Total outage winters	N	6	16	22
		Mean	1.3	1.3	1.3
		Std. Deviation	1.4	1.2	1.2
		Median	1.0	1.0	1.0
		Maximum	3	4	4

A5.5 Contd./-

A5.5 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Minimum	0.0	0.0	0.0
Mysore	Demand cut summers	N	29	23	52
		Mean	0.4	0.2	0.3
		Std. Deviation	1.3	0.7	1.1
		Median	0.0	0.0	0.0
		Maximum	5	3	5
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	29	23	52
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0	0	0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	29	23	52
		Mean	1.4	2.0	1.7
		Std. Deviation	1.5	0.9	1.3
		Median	1.0	2.0	2.0
		Maximum	5	4	5
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	29	23	52
		Mean	0.6	0.5	0.5
		Std. Deviation	1.1	0.6	0.9
		Median	0.0	0.0	0.0
		Maximum	5	2	5
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	29	23	52
		Mean	2.0	3.4	2.6
		Std. Deviation	1.8	1.6	1.9
		Median	2.0	4.0	3.0
		Maximum	6	6.4	6.4
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	29	23	52
		Mean	0.0	0.3	0.1
		Std. Deviation	0.0	0.9	0.6
		Median	0.0	0.0	0.0
		Maximum	0	4	4
		Minimum	0.0	0.0	0.0
	Total outage summers	N	29	23	52
		Mean	3.8	5.6	4.6
		Std. Deviation	3.1	2.0	2.8
		Median	3.0	6.0	4.5
		Maximum	14	10	14
		Minimum	0.0	1.0	0.0
	Total outage winters	N	29	23	52
		Mean	0.6	0.8	0.7
		Std. Deviation	1.1	1.4	1.2

A5.5 Contd./

A5.5 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Median	0.0	0.0	0.0
		Maximum	5	6	6
		Minimum	0.0	0.0	0.0
Mangalore	Demand cut summers	N	10	10	20
		Mean	0.2	0.0	0.1
		Std. Deviation	0.5	0.0	0.3
		Median	0.0	0.0	0.0
		Maximum	1.5	0	1.5
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	10	10	20
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0	0	0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	10	10	20
		Mean	1.5	0.9	1.2
		Std. Deviation	1.2	1.0	1.1
		Median	1.0	0.5	1.0
		Maximum	4	3	4
		Minimum	0.5	0.0	0.0
	Unscheduled cut winters	N	10	10	20
		Mean	0.3	0.3	0.3
		Std. Deviation	0.4	0.4	0.4
		Median	0.1	0.0	0.0
		Maximum	1	1	1
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	10	10	20
		Mean	1.7	1.3	1.5
		Std. Deviation	1.3	1.4	1.4
		Median	1.5	0.8	1.3
		Maximum	4	4	4
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	10	10	20
		Mean	0.1	0.2	0.1
		Std. Deviation	0.3	0.3	0.3
		Median	0.0	0.0	0.0
		Maximum	1	1	1
		Minimum	0.0	0.0	0.0
	Total outage summers	N	10	10	20
		Mean	3.3	2.1	2.7
		Std. Deviation	2.0	2.3	2.2
		Median	2.5	1.5	2.0
		Maximum	8	7	8
		Minimum	1.5	0.0	0.0
	Total outage winters	N	10	10	20
		Mean	0.4	0.4	0.4
		Std. Deviation	0.6	0.7	0.6

A5.5 Contd./

A5.5 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Median	0.1	0.0	0.0
		Maximum	1.5	2	2
		Minimum	0.0	0.0	0.0
Shimoga	Demand cut summers	N	11	16	27
		Mean	0.7	0.9	0.8
		Std. Deviation	1.2	1.7	1.5
		Median	0.0	0.0	0.0
		Maximum	3	6	6
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	11	16	27
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0	0	0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	11	16	27
		Mean	0.6	0.9	0.8
		Std. Deviation	0.7	0.6	0.7
		Median	0.5	0.8	0.6
		Maximum	2	2	2
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	11	16	27
		Mean	0.4	0.1	0.2
		Std. Deviation	0.5	0.3	0.4
		Median	0.0	0.0	0.0
		Maximum	1	1	1
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	11	16	27
		Mean	1.6	2.6	2.2
		Std. Deviation	1.3	1.3	1.4
		Median	2.0	2.8	2.0
		Maximum	4	4	4
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	11	16	27
		Mean	0.3	0.0	0.1
		Std. Deviation	0.6	0.0	0.4
		Median	0.0	0.0	0.0
		Maximum	2	0	2
		Minimum	0.0	0.0	0.0
	Total outage summers	N	11	16	27
		Mean	2.9	4.3	3.7
		Std. Deviation	2.0	2.1	2.2
		Median	3.0	4.5	4.0
		Maximum	7	8.5	8.5
		Minimum	0.0	0.0	0.0
	Total outage winters	N	11	16	27
		Mean	0.6	0.1	0.3
		Std. Deviation	1.0	0.3	0.7

A5.5 Contd./

A5.5 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Median	0.0	0.0	0.0
		Maximum	3	1	3
		Minimum	0.0	0.0	0.0
Belgaum	Demand cut summers	N	9	8	17
		Mean	0.1	0.0	0.1
		Std. Deviation	0.4	0.0	0.3
		Median	0.0	0.0	0.0
		Maximum	1.2	0	1.2
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	9	8	17
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0	0	0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	9	8	17
		Mean	1.5	1.0	1.3
		Std. Deviation	1.4	1.0	1.2
		Median	2.0	0.5	0.5
		Maximum	4	3	4
		Minimum	0.0	0.5	0.0
	Unscheduled cut winters	N	9	8	17
		Mean	0.6	0.1	0.3
		Std. Deviation	1.0	0.2	0.8
		Median	0.0	0.0	0.0
		Maximum	3	0.5	3
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	9	8	17
		Mean	1.2	0.8	1.0
		Std. Deviation	1.4	0.5	1.0
		Median	0.5	1.0	1.0
		Maximum	4	1.5	4
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	9	8	17
		Mean	0.1	0.0	0.1
		Std. Deviation	0.3	0.0	0.2
		Median	0.0	0.0	0.0
		Maximum	1	0	1
		Minimum	0.0	0.0	0.0
	Total outage summers	N	9	8	17
		Mean	2.9	1.8	2.4
		Std. Deviation	2.0	0.9	1.6
		Median	2.0	1.5	2.0
		Maximum	6	3.5	6
		Minimum	0.0	1.0	0.0
	Total outage winters	N	9	8	17
		Mean	0.7	0.1	0.4
		Std. Deviation	1.2	0.2	0.9

A5.5 Contd./

A5.5 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Median	0.0	0.0	0.0
		Maximum	3	0.5	3
		Minimum	0.0	0.0	0.0
Hubli	Demand cut summers	N	13	19	32
		Mean	0.2	0.1	0.1
		Std. Deviation	0.6	0.6	0.6
		Median	0.0	0.0	0.0
		Maximum	2.25	2.4	2.4
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	13	19	32
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0	0	0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	13	19	32
		Mean	1.2	1.2	1.2
		Std. Deviation	1.1	0.9	1.0
		Median	0.5	1.0	1.0
		Maximum	3	3	3
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	13	19	32
		Mean	0.2	0.4	0.3
		Std. Deviation	0.6	0.7	0.6
		Median	0.0	0.0	0.0
		Maximum	2	2	2
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	13	19	32
		Mean	1.9	1.5	1.7
		Std. Deviation	1.8	1.5	1.6
		Median	1.5	1.0	1.3
		Maximum	4	4	4
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	13	19	32
		Mean	0.0	0.1	0.0
		Std. Deviation	0.0	0.2	0.2
		Median	0.0	0.0	0.0
		Maximum	0	1	1
		Minimum	0.0	0.0	0.0
	Total outage summers	N	13	19	32
		Mean	3.3	2.9	3.1
		Std. Deviation	2.6	1.8	2.1
		Median	3.0	3.0	3.0
		Maximum	9	6	9
		Minimum	0.0	0.0	0.0
	Total outage winters	N	13	19	32
		Mean	0.2	0.5	0.4
		Std. Deviation	0.6	0.8	0.7

A5.5 Contd./

A5.5 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Median	0.0	0.0	0.0
		Maximum	2	2	2
		Minimum	0.0	0.0	0.0
Munirabad	Demand cut summers	N	11	11	22
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0	0	0
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	11	11	22
		Mean	0.0	0.0	0.0
		Std. Deviation	0.0	0.0	0.0
		Median	0.0	0.0	0.0
		Maximum	0	0	0
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	11	11	22
		Mean	1.2	1.3	1.3
		Std. Deviation	1.3	0.6	1.0
		Median	1.0	1.0	1.0
		Maximum	4	2	4
		Minimum	0.0	0.5	0.0
	Unscheduled cut winters	N	11	11	22
		Mean	0.4	0.0	0.2
		Std. Deviation	0.6	0.2	0.5
		Median	0.0	0.0	0.0
		Maximum	1.5	0.5	1.5
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	11.0	11.0	22.0
		Mean	1.5	2.0	1.8
		Std. Deviation	1.4	0.1	1.0
		Median	2.0	2.0	2.0
		Maximum	4	2.4	4
		Minimum	0.0	2.0	0.0
	Scheduled cut winters	N	11.0	11.0	22.0
		Mean	0.2	0.0	0.1
		Std. Deviation	0.6	0.0	0.4
		Median	0.0	0.0	0.0
		Maximum	2	0	2
		Minimum	0.0	0.0	0.0
	Total outage summers	N	11.0	11.0	22.0
		Mean	2.7	3.3	3.0
		Std. Deviation	2.3	0.6	1.6
		Median	2.5	3.0	3.0
		Maximum	7	4	7
		Minimum	0.0	2.5	0.0
	Total outage winters	N	11	11	22

A5.5 Contd./

A5.5 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Mean	0.6	0.0	0.3
		Std. Deviation	1.0	0.2	0.7
		Median	0.0	0.0	0.0
		Maximum	3	0.5	3
		Minimum	0.0	0.0	0.0
Total	Demand cut summers	N	207	294	501
		Mean	0.5	0.2	0.3
		Std. Deviation	1.1	0.7	0.9
		Median	0.0	0.0	0.0
		Maximum	6	6	6
		Minimum	0.0	0.0	0.0
	Demand cut winters	N	207	294	501
		Mean	0.1	0.0	0.0
		Std. Deviation	0.5	0.1	0.3
		Median	0.0	0.0	0.0
		Maximum	4	1	4
		Minimum	0.0	0.0	0.0
	Unscheduled cut summers	N	207	294	501
		Mean	1.6	1.6	1.6
		Std. Deviation	1.5	1.3	1.4
		Median	1.0	1.5	1.1
		Maximum	8	8	8
		Minimum	0.0	0.0	0.0
	Unscheduled cut winters	N	207	294	501
		Mean	0.6	0.4	0.5
		Std. Deviation	0.9	0.7	0.8
		Median	0.0	0.0	0.0
		Maximum	5	4	5
		Minimum	0.0	0.0	0.0
	Scheduled cut summers	N	207	294	501
		Mean	1.8	2.2	2.0
		Std. Deviation	1.7	1.6	1.6
		Median	2.0	2.0	2.0
		Maximum	6.5	6.9	6.9
		Minimum	0.0	0.0	0.0
	Scheduled cut winters	N	207	294	501
		Mean	0.2	0.1	0.2
		Std. Deviation	0.7	0.4	0.5
		Median	0.0	0.0	0.0
		Maximum	4	4	4
		Minimum	0.0	0.0	0.0
	Total outage summers	N	207	294	501
		Mean	4.0	4.0	4.0
		Std. Deviation	2.7	2.2	2.4
		Median	4.0	4.0	4.0
		Maximum	14	11	14
		Minimum	0.0	0.0	0.0
	Total outage winters	N	207	294	501

A5.5 Contd./

A5.5 Continued

Circle	Type of cut	Statistics	HT	LT	Total
		Mean	0.9	0.6	0.7
		Std. Deviation	1.4	0.9	1.1
		Median	0.0	0.0	0.0
		Maximum	9	6	9
		Minimum	0.0	0.0	0.0

A5.6 Duration of each type of power cut classified according to various shifts and captive and non-captive units in Karnataka (hrs./day)

Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
1	Grid Only	N	94	94	94	94	94	94	94	94
		Mean	0.1	0.0	1.5	0.3	2.1	0.0	3.7	0.4
		Std. Deviation	0.5	0.0	1.1	0.6	1.4	0.1	1.6	0.6
		Median	0.0	0.0	1.0	0.0	2.0	0.0	4.0	0.0
		Maximum	4.0	0.0	4.0	4.0	4.0	1.0	8.0	4.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Captive & Grid	N	138	138	138	138	138	138	138	138
		Mean	0.3	0.0	1.5	0.5	2.1	0.2	3.8	0.7
		Std. Deviation	0.7	0.1	1.1	0.7	1.4	0.5	1.9	1.0
		Median	0.0	0.0	1.5	0.0	2.0	0.0	4.0	0.0
		Maximum	4.0	1.0	6.0	5.0	5.3	3.0	8.0	5.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	All together	N	232	232	232	232	232	232	232	232
		Mean	0.2	0.0	1.5	0.4	2.1	0.1	3.8	0.5
		Std. Deviation	0.7	0.1	1.1	0.7	1.4	0.4	1.8	0.9
		Median	0.0	0.0	1.2	0.0	2.0	0.0	4.0	0.0
		Maximum	4.0	1.0	6.0	5.0	5.3	3.0	8.0	5.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Grid Only	N	40	40	40	40	40	40	40	40
		Mean	0.2	0.0	1.5	0.4	2.5	0.2	4.2	0.6
		Std. Deviation	1.0	0.0	1.1	0.7	1.6	0.7	2.3	1.0
		Median	0.0	0.0	1.0	0.0	2.5	0.0	4.0	0.0
		Maximum	6.0	0.0	4.0	4.0	6.0	4.0	8.5	4.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Captive & Grid	N	89	89	89	89	89	89	89	89
		Mean	0.4	0.0	1.8	0.7	2.0	0.1	4.2	0.8
		Std. Deviation	1.0	0.1	1.4	0.9	1.7	0.5	2.4	1.0
		Median	0.0	0.0	1.5	0.5	2.0	0.0	4.0	0.5
		Maximum	4.0	1.0	7.0	4.0	6.9	2.0	9.0	4.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	All together	N	129	129	129	129	129	129	129	129
		Mean	0.3	0.0	1.7	0.6	2.2	0.2	4.2	0.8
		Std. Deviation	1.0	0.1	1.3	0.8	1.7	0.5	2.3	1.0
		Median	0.0	0.0	1.2	0.0	2.0	0.0	4.0	0.3
		Maximum	6.0	1.0	7.0	4.0	6.9	4.0	9.0	4.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Grid Only	N	7	7	7	7	7	7	7	7
		Mean	0.4	0.0	1.2	0.2	1.8	0.0	3.5	0.2
		Std. Deviation	1.1	0.0	1.4	0.4	2.4	0.0	3.4	0.4
		Median	0.0	0.0	0.5	0.0	1.0	0.0	3.0	0.0

A5.6 Contd./-

A5.6 Continued

Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers
		Maximum	3.0	0.0	4.0	1.0	6.4	0.0	8.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Captive & Grid	N	113	113	113	113	113	113	113
		Mean	0.6	0.2	2.2	0.7	2.2	0.3	4.9
		Std. Deviation	1.3	0.7	1.8	1.0	1.8	0.8	2.9
		Median	0.0	0.0	2.0	0.0	2.0	0.0	4.5
		Maximum	6.0	4.0	8.0	5.0	6.5	4.0	14.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	All together	N	120	120	120	120	120	120	120
		Mean	0.6	0.1	2.1	0.7	2.2	0.3	4.8
		Std. Deviation	1.3	0.6	1.8	0.9	1.8	0.7	3.0
		Median	0.0	0.0	2.0	0.0	2.0	0.0	4.5
		Maximum	6.0	4.0	8.0	5.0	6.5	4.0	14.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	Grid Only	N	141	141	141	141	141	141	141
		Mean	0.2	0.0	1.5	0.3	2.2	0.1	3.8
		Std. Deviation	0.7	0.0	1.1	0.7	1.5	0.4	1.9
		Median	0.0	0.0	1.0	0.0	2.0	0.0	4.0
		Maximum	6.0	0.0	4.0	4.0	6.4	4.0	8.5
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Captive & Grid	N	340	340	340	340	340	340	340
		Mean	0.4	0.1	1.8	0.6	2.1	0.2	4.3
		Std. Deviation	1.0	0.4	1.5	0.8	1.6	0.6	2.4
		Median	0.0	0.0	1.7	0.0	2.0	0.0	4.0
		Maximum	6.0	4.0	8.0	5.0	6.9	4.0	14.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	All together	N	481	481	481	481	481	481	481
		Mean	0.3	0.0	1.7	0.5	2.1	0.2	4.1
		Std. Deviation	0.9	0.3	1.4	0.8	1.6	0.5	2.3
		Median	0.0	0.0	1.5	0.0	2.0	0.0	4.0
		Maximum	6.0	4.0	8.0	5.0	6.9	4.0	14.0
		Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0

A5.6.1 Duration of each type of power cut classified according to various shifts and captive and non-captive units in industrial category in Karnataka (hrs./day)

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
HT	1	Grid Only	N	6	6	6	6	6	6	6	6
			Mean	0.0	0.0	1.5	0.0	1.0	0.0	2.5	0.0
			Std. Deviation	0.0	0.0	1.0	0.0	1.1	0.0	1.6	0.0
			Median	0.0	0.0	1.3	0.0	0.8	0.0	2.5	0.0
			Maximum	0	0	3	0	3	0	5	0
			Minimum	0.0	0.0	0.3	0.0	0.0	0.0	0.8	0.0
		Captive & Grid	N	49	49	49	49	49	49	49	49
			Mean	0.6	0.0	1.4	0.5	2.0	0.2	4.0	0.8
			Std. Deviation	1.0	0.0	0.9	0.9	1.4	0.6	1.7	1.2
			Median	0.0	0.0	1.3	0.0	2.0	0.0	4.0	0.0
			Maximum	4	0	4	5	5	3	8	5
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
		All together	N	55	55	55	55	55	55	55	55
			Mean	0.5	0.0	1.4	0.5	1.9	0.2	3.8	0.7
			Std. Deviation	1.0	0.0	0.9	0.9	1.4	0.6	1.7	1.1
			Median	0.0	0.0	1.3	0.0	2.0	0.0	4.0	0.0
			Maximum	4	0	4	5	5	3	8	5
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0
	2	Grid Only	N	7	7	7	7	7	7	7	7
			Mean	0.0	0.0	1.1	0.4	2.0	0.6	3.1	0.9
			Std. Deviation	0.0	0.0	1.1	0.5	2.0	1.5	1.9	1.4
			Median	0.0	0.0	1.0	0.0	2.0	0.0	4.0	0.5
			Maximum	0	0	3	1	4	4	5	4
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	45	45	45	45	45	45	45	45
			Mean	0.5	0.0	1.5	0.6	1.8	0.2	3.7	0.8
			Std. Deviation	1.0	0.1	1.4	0.9	1.7	0.5	2.4	1.2
			Median	0.0	0.0	1.0	0.0	1.5	0.0	3.5	0.0
			Maximum	4	1	5	4	6	2	9	4
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	52	52	52	52	52	52	52	52
			Mean	0.4	0.0	1.4	0.6	1.8	0.2	3.7	0.8
			Std. Deviation	1.0	0.1	1.3	0.9	1.7	0.7	2.4	1.2
			Median	0.0	0.0	1.0	0.0	1.6	0.0	3.8	0.0
			Maximum	4	1	5	4	6	4	9	4
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Grid Only	N	2	2	2	2	2	2	2	2
			Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Std. Deviation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

A5.6.1 Contd./-

A5.6.1 Continued

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
			Maximum	0	0	0	0	0	0	0	0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	89	89	89	89	89	89	89	89
			Mean	0.6	0.2	2.1	0.7	2.0	0.3	4.7	1.2
			Std. Deviation	1.3	0.7	1.8	0.9	1.8	0.7	3.1	1.7
			Median	0.0	0.0	2.0	0.5	2.0	0.0	4.0	0.5
			Maximum	6	4	8	5	7	4	14	9
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	91	91	91	91	91	91	91	91
			Mean	0.6	0.2	2.0	0.7	1.9	0.3	4.6	1.1
			Std. Deviation	1.3	0.7	1.8	0.9	1.8	0.7	3.2	1.7
			Median	0.0	0.0	2.0	0.3	2.0	0.0	4.0	0.3
			Maximum	6	4	8	5	7	4	14	9
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	Grid Only	N	15	15	15	15	15	15	15	15
			Mean	0.0	0.0	1.1	0.2	1.3	0.3	2.4	0.4
			Std. Deviation	0.0	0.0	1.0	0.4	1.6	1.0	1.9	1.0
			Median	0.0	0.0	1.0	0.0	0.5	0.0	3.0	0.0
			Maximum	0	0	3	1	4	4	5	4
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	183	183	183	183	183	183	183	183
			Mean	0.6	0.1	1.7	0.6	2.0	0.2	4.3	1.0
			Std. Deviation	1.2	0.5	1.5	0.9	1.6	0.6	2.7	1.5
			Median	0.0	0.0	1.3	0.0	2.0	0.0	4.0	0.2
			Maximum	6	4	8	5	7	4	14	9
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	198	198	198	198	198	198	198	198
			Mean	0.5	0.1	1.7	0.6	1.9	0.2	4.1	0.9
			Std. Deviation	1.1	0.5	1.5	0.9	1.7	0.7	2.6	1.4
			Median	0.0	0.0	1.2	0.0	2.0	0.0	4.0	0.0
			Maximum	6	4	8	5	7	4	14	9
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LT	1	Grid Only	N	88	88	88	88	88	88	88	88
			Mean	0.1	0.0	1.5	0.4	2.1	0.0	3.8	0.4
			Std. Deviation	0.5	0.0	1.1	0.7	1.4	0.1	1.6	0.7
			Median	0.0	0.0	1.0	0.0	2.0	0.0	4.0	0.0
			Maximum	4	0	4	4	4	1	8	4
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	89	89	89	89	89	89	89	89
			Mean	0.1	0.0	1.6	0.4	2.1	0.2	3.8	0.6
			Std. Deviation	0.4	0.1	1.2	0.6	1.4	0.4	2.0	0.8
			Median	0.0	0.0	1.7	0.0	2.0	0.0	4.0	0.0

A5.6.1 Contd./-

A5.6.1 Continued

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
			Maximum	3	1	6	2	4	2	8	3
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	177	177	177	177	177	177	177	177
			Mean	0.1	0.0	1.5	0.4	2.1	0.1	3.8	0.5
			Std. Deviation	0.5	0.1	1.2	0.6	1.4	0.3	1.8	0.8
			Median	0.0	0.0	1.0	0.0	2.0	0.0	4.0	0.0
			Maximum	4	1	6	4	4	2	8	4
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Grid Only	N	33	33	33	33	33	33	33	33
			Mean	0.2	0.0	1.5	0.4	2.6	0.1	4.4	0.5
			Std. Deviation	1.1	0.0	1.1	0.8	1.6	0.4	2.3	0.9
			Median	0.0	0.0	1.0	0.0	3.0	0.0	4.5	0.0
			Maximum	6	0	4	4	6	2	9	4
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
		Captive & Grid	N	44	44	44	44	44	44	44	44
			Mean	0.3	0.0	2.1	0.7	2.2	0.1	4.6	0.9
			Std. Deviation	0.9	0.0	1.4	0.8	1.6	0.4	2.2	0.9
			Median	0.0	0.0	2.0	0.8	2.0	0.0	4.5	0.8
			Maximum	4	0	7	2	7	2	9	3
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	77	77	77	77	77	77	77	77
			Mean	0.3	0.0	1.8	0.6	2.4	0.1	4.5	0.7
			Std. Deviation	1.0	0.0	1.3	0.8	1.6	0.4	2.2	0.9
			Median	0.0	0.0	1.9	0.3	2.0	0.0	4.5	0.5
			Maximum	6	0	7	4	7	2	9	4
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Grid Only	N	5	5	5	5	5	5	5	5
			Mean	0.6	0.0	1.7	0.3	2.6	0.0	4.9	0.3
			Std. Deviation	1.3	0.0	1.4	0.4	2.5	0.0	3.0	0.4
			Median	0.0	0.0	1.6	0.0	1.0	0.0	5.0	0.0
			Maximum	3.0	0.0	4.0	1.0	6.4	0.0	8.0	1.0
			Minimum	0.0	0.0	0.5	0.0	0.5	0.0	1.0	0.0
		Captive & Grid	N	24	24	24	24	24	24	24	24
			Mean	0.4	0.0	2.4	0.6	2.9	0.4	5.6	1.0
			Std. Deviation	0.9	0.1	2.0	1.1	1.8	1.0	2.1	1.6
			Median	0.0	0.0	2.0	0.0	3.0	0.0	5.8	0.0
			Maximum	3.0	0.3	8.0	4.0	6.0	4.0	11.0	6.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
		All together	N	29	29	29	29	29	29	29	29
			Mean	0.4	0.0	2.3	0.6	2.8	0.3	5.5	0.9
			Std. Deviation	1.0	0.0	1.9	1.0	1.9	0.9	2.2	1.5
			Median	0.0	0.0	2.0	0.0	3.0	0.0	5.5	0.0

A5.6.1 Contd./-

A5.6.1 Continued

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
			Maximum	3.0	0.3	8.0	4.0	6.4	4.0	11.0	6.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
	Total	Grid Only	N	126	126	126	126	126	126	126	126
			Mean	0.2	0.0	1.5	0.4	2.3	0.0	4.0	0.4
			Std. Deviation	0.7	0.0	1.1	0.7	1.5	0.2	1.9	0.7
			Median	0.0	0.0	1.0	0.0	2.0	0.0	4.0	0.0
			Maximum	6.0	0.0	4.0	4.0	6.4	2.0	8.5	4.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	157	157	157	157	157	157	157	157
			Mean	0.2	0.0	1.8	0.5	2.2	0.2	4.3	0.7
			Std. Deviation	0.7	0.1	1.4	0.7	1.6	0.5	2.2	1.0
			Median	0.0	0.0	2.0	0.0	2.0	0.0	4.0	0.0
			Maximum	4.0	1.0	8.0	4.0	6.9	4.0	11.0	6.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	283	283	283	283	283	283	283	283
			Mean	0.2	0.0	1.7	0.5	2.3	0.1	4.1	0.6
			Std. Deviation	0.7	0.1	1.3	0.7	1.5	0.4	2.0	0.9
			Median	0.0	0.0	1.6	0.0	2.0	0.0	4.0	0.0
			Maximum	6.0	1.0	8.0	4.0	6.9	4.0	11.0	6.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1	Grid Only	N	94	94	94	94	94	94	94	94
			Mean	0.1	0.0	1.5	0.3	2.1	0.0	3.7	0.4
			Std. Deviation	0.5	0.0	1.1	0.6	1.4	0.1	1.6	0.6
			Median	0.0	0.0	1.0	0.0	2.0	0.0	4.0	0.0
			Maximum	4.0	0.0	4.0	4.0	4.0	1.0	8.0	4.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	138	138	138	138	138	138	138	138
			Mean	0.3	0.0	1.5	0.5	2.1	0.2	3.8	0.7
			Std. Deviation	0.7	0.1	1.1	0.7	1.4	0.5	1.9	1.0
			Median	0.0	0.0	1.5	0.0	2.0	0.0	4.0	0.0
			Maximum	4.0	1.0	6.0	5.0	5.3	3.0	8.0	5.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	232	232	232	232	232	232	232	232
			Mean	0.2	0.0	1.5	0.4	2.1	0.1	3.8	0.5
			Std. Deviation	0.7	0.1	1.1	0.7	1.4	0.4	1.8	0.9
			Median	0.0	0.0	1.2	0.0	2.0	0.0	4.0	0.0
			Maximum	4.0	1.0	6.0	5.0	5.3	3.0	8.0	5.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	Grid Only	N	40	40	40	40	40	40	40	40
			Mean	0.2	0.0	1.5	0.4	2.5	0.2	4.2	0.6
			Std. Deviation	1.0	0.0	1.1	0.7	1.6	0.7	2.3	1.0
			Median	0.0	0.0	1.0	0.0	2.5	0.0	4.0	0.0

A5.6.1 Contd./-

A5.6.1 Continued

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
			Maximum	6.0	0.0	4.0	4.0	6.0	4.0	8.5	4.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	89	89	89	89	89	89	89	89
			Mean	0.4	0.0	1.8	0.7	2.0	0.1	4.2	0.8
			Std. Deviation	1.0	0.1	1.4	0.9	1.7	0.5	2.4	1.0
			Median	0.0	0.0	1.5	0.5	2.0	0.0	4.0	0.5
			Maximum	4.0	1.0	7.0	4.0	6.9	2.0	9.0	4.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	129	129	129	129	129	129	129	129
			Mean	0.3	0.0	1.7	0.6	2.2	0.2	4.2	0.8
			Std. Deviation	1.0	0.1	1.3	0.8	1.7	0.5	2.3	1.0
			Median	0.0	0.0	1.2	0.0	2.0	0.0	4.0	0.3
			Maximum	6.0	1.0	7.0	4.0	6.9	4.0	9.0	4.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	Grid Only	N	7	7	7	7	7	7	7	7
			Mean	0.4	0.0	1.2	0.2	1.8	0.0	3.5	0.2
			Std. Deviation	1.1	0.0	1.4	0.4	2.4	0.0	3.4	0.4
			Median	0.0	0.0	0.5	0.0	1.0	0.0	3.0	0.0
			Maximum	3.0	0.0	4.0	1.0	6.4	0.0	8.0	1.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Captive & Grid	N	113	113	113	113	113	113	113	113
			Mean	0.6	0.2	2.2	0.7	2.2	0.3	4.9	1.1
			Std. Deviation	1.3	0.7	1.8	1.0	1.8	0.8	2.9	1.7
			Median	0.0	0.0	2.0	0.0	2.0	0.0	4.5	0.3
			Maximum	6.0	4.0	8.0	5.0	6.5	4.0	14.0	9.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	120	120	120	120	120	120	120	120
			Mean	0.6	0.1	2.1	0.7	2.2	0.3	4.8	1.1
			Std. Deviation	1.3	0.6	1.8	0.9	1.8	0.7	3.0	1.6
			Median	0.0	0.0	2.0	0.0	2.0	0.0	4.5	0.1
			Maximum	6.0	4.0	8.0	5.0	6.5	4.0	14.0	9.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	Grid Only	N	141	141	141	141	141	141	141	141
			Mean	0.2	0.0	1.5	0.3	2.2	0.1	3.8	0.4
			Std. Deviation	0.7	0.0	1.1	0.7	1.5	0.4	1.9	0.8
			Median	0.0	0.0	1.0	0.0	2.0	0.0	4.0	0.0
			Maximum	6.0	0.0	4.0	4.0	6.4	4.0	8.5	4.0
			Minimum	0.0	0.0	0.0	0.0	0q2.0	0.0	0.0	0.0
		Captive & Grid	N	340	340	340	340	340	340	340	340
			Mean	0.4	0.1	1.8	0.6	2.1	0.2	4.3	0.9
			Std. Deviation	1.0	0.4	1.5	0.8	1.6	0.6	2.4	1.3
			Median	0.0	0.0	1.7	0.0	2.0	0.0	4.0	0.0

A5.6.1 Contd./-

A5.6.1 Continued

Industry Category	Shifts	Source of power	Statistics	Demand cut summers	Demand cut winters	Unscheduled cut summers	Unscheduled cut winters	Scheduled cut summers	Scheduled cut winters	Total outage summers	Total outage winters
			Maximum	6.0	4.0	8.0	5.0	6.9	4.0	14.0	9.0
			Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		All together	N	481	481	481	481	481	481	481	481
			Mean	0.3	0.0	1.7	0.5	2.1	0.2	4.1	0.7
			Std. Deviation	0.9	0.3	1.4	0.8	1.6	0.5	2.3	1.2
			Median	0.0	0.0	1.5	0.0	2.0	0.0	4.0	0.0

ANNEX 6

SURVEY RESULTS FOR AGRICULTURE

A6.1 Distribution of pumpsets by land holding categories in Haryana

Land holding category	Electric	Diesel	No of households
M (Marginal)	84	98	161
S (Small)	143	148	237
SM (Semi-medium)	110	128	170
ME (Medium)	76	96	93
L (Large)	46	46	34
Total	459	516	695

A6.1.1 Agro-ecological zone-wise distribution of pumpsets for various land holding categories in Haryana

Land holding category	Electric	Diesel	No of households
Zone 2: Western plain, Kutch and part of the Kathiawar peninsula			
M (Marginal)	17	30	46
S (Small)	31	30	56
SM (Semi-medium)	33	39	59
ME (Medium)	30	32	38
L (Large)	21	21	19
Total	132	152	218
Zone 4: Northern plains and central high land including the aravalis			
M (Marginal)	62	67	109
S (Small)	105	115	171
SM (Semi-medium)	70	78	97
ME (Medium)	41	60	51
L (Large)	21	25	14
Total	299	345	442
Zone 9: Northern plain, hot sub-humid (dry) region			
M (Marginal)	5	-	5
S (Small)	7	1	8
SM (Semi-medium)	7	2	7
ME (Medium)	5	4	4
L (Large)	4	-	1
Total	28	7	25
Zone 14: Western Himalayas, warm sub-humid region			
M (Marginal)	-	1	1
S (Small)	-	2	2
SM (Semi-medium)	-	9	7
ME (Medium)	-	-	-
L (Large)	-	-	-
Total	-	12	10

A6.1.2 District - wise distribution of pumpsets in each agro-ecological zone in Haryana

District	Land holding category	Electric	Diesel	No of households
Zone 2: Western plain, Kutch and part of the Kathiawar peninsula				
Bhiwani	M (Marginal)	-	5	5
	S (Small)	2	5	5
	SM (Semi-medium)	-	4	4
	ME (Medium)	-	6	4
	L (Large)	-	8	3
	Total	2	28	21
Hisar	M (Marginal)	-	22	22
	S (Small)	-	14	14
	SM (Semi-medium)	-	19	13
	ME (Medium)	-	10	4
	L (Large)	-	6	2
	Total	-	71	55
Mahendragarh	M (Marginal)	13	-	13
	S (Small)	23	-	22
	SM (Semi-medium)	22	1	20
	ME (Medium)	19	-	14
	L (Large)	5	-	3
	Total	82	1	72
Sirsa	M (Marginal)	4	3	6
	S (Small)	6	11	15
	SM (Semi-medium)	11	15	22
	ME (Medium)	11	16	16
	L (Large)	16	7	11
	Total	48	52	70
Zone 4: Northern plains and central high land including the aravalis				
Faridabad	M (Marginal)	1	1	2
	S (Small)	2	4	4
	SM (Semi-medium)	7	15	10
	ME (Medium)	6	8	7
	L (Large)	7	4	3
	Total	23	32	26
Kaithal	M (Marginal)	20	19	31
	S (Small)	33	42	57
	SM (Semi-medium)	29	50	53
	ME (Medium)	17	19	20
	L (Large)	11	6	6
	Total	110	136	167
Kurukshetra	M (Marginal)	18	1	18
	S (Small)	21	1	21
	SM (Semi-medium)	12	2	11
	ME (Medium)	3	2	3
	L (Large)	3	-	1
	Total	57	6	54

A6.1.2 Contd./-

A6.1.2 Continued

District	Land holding category	Electric	Diesel	No of households
Panipat	M (Marginal)	21	2	20
	S (Small)	31	1	30
	SM (Semi-medium)	9	-	7
	ME (Medium)	7	-	3
	Total	68	3	60
Rewan	M (Marginal)	1	-	1
	S (Small)	7	-	6
	SM (Semi-medium)	8	-	6
	ME (Medium)	1	-	1
	Total	17	-	14
Sonipat	M (Marginal)	1	44	37
	S (Small)	11	67	53
	SM (Semi-medium)	5	11	10
	ME (Medium)	7	31	17
	L (Large)	-	15	4
	Total	24	168	121
Zone 9: Northern plain, hot sub-humid (dry) region				
Kurukshetra	M (Marginal)	5	-	5
	S (Small)	2	-	2
	SM (Semi-medium)	3	-	3
	ME (Medium)	3	-	2
	L (Large)	4	-	1
	Total	17	-	13
Yamuna Nagar	M (Marginal)	-	-	-
	S (Small)	5	1	6
	SM (Semi-medium)	4	2	4
	ME (Medium)	2	4	2
	L (Large)	-	-	-
	Total	11	7	12
Zone 14: Western Himalayas, warm subhumid region				
Yamuna Nagar	M (Marginal)	-	1	1
	S (Small)	-	2	2
	SM (Semi-medium)	-	9	7
	M(Medium)	-	-	-
	L (Large)	-	-	-
	Total	-	12	10

A6.2 Distribution of pumpsets by land holding categories in Karnataka

Land holding category	Electric	Diesel	Kerosene	No of households
M (Marginal)	150	6	1	148
S (Small)	251	16	5	251
SM (Semi-medium)	235	18	1	227
ME (Medium)	154	14	-	131
L (Large)	80	9	-	55
Total pumps	870	63	7	812

A6.2.1 Agro-ecological zone - wise distribution of pumpsets for various land holding categories in Karnataka

Land holding category	Electric	Diesel	Kerosene	No of households
Zone 3: Deccan Plateau, hot-arid region				
M (Marginal)	27	-	-	25
S (Small)	46	-	-	43
SM (Semi-medium)	65	-	-	57
ME (Medium)	43	-	-	39
L (Large)	25	-	-	19
Total	206	-	-	183
Zone 6: Deccan Plateau, semi-arid region				
M (Marginal)	40	2	-	42
S (Small)	133	10	-	132
SM (Semi-medium)	106	1	-	100
ME (Medium)	83	3	-	66
L (Large)	40		-	24
Total	402	16	-	364
Zone 7: Deccan (Telangana) Plateau and Eastern Ghats				
M (Marginal)	6	1	-	7
S (Small)	12	5	-	16
SM (Semi-medium)	20	6	-	23
ME (Medium)	6	2	-	4
L (Large)	3		-	1
Total	47	14	-	51
Zone 8: Eastern Ghats, TN uplands and Deccan (Karnataka region)				
M (Marginal)	30	1	-	29
S (Small)	48	-	-	45
SM (Semi-medium)	35	2	-	32
ME (Medium)	15	-	-	10
L (Large)	5	-	-	2
Total	133	3	-	118
Zone 19: Western Ghats and coastal plains				
M (Marginal)	47	2	1	45
S (Small)	12	1	5	15
SM (Semi-medium)	9	9	1	15
ME (Medium)	7	9	-	12
L (Large)	7	9	-	9
Total	82	30	7	96

A6.2.2 District - wise distribution of pumpsets under each agro-ecological zone in Karnataka

District	Land holding category	Electricity	Diesel	Kerosene	No of households
Zone 3: Deccan Plateau, hot-arid region					
Bellary	M (Marginal)	8	-	-	7
	S (Small)	24	-	-	23
	SM (Semi-medium)	44	-	-	37
	ME (Medium)	34	-	-	31
	L (Large)	23	-	-	17
	Total	133	-	-	115
Chitradurga	M (Marginal)	19	-	-	18
	S (Small)	22	-	-	20
	SM (Semi-medium)	21	-	-	20
	ME (Medium)	9	-	-	8
	L (Large)	2	-	-	2
	Total	73	-	-	68
Zone 6: Deccan Plateau, semi-arid region					
Belgaum	M (Marginal)	10	-	-	10
	S (Small)	39	3		40
	SM (Semi-medium)	19	-	-	14
	ME(Medium)	12	-	-	11
	L (Large)	6	-	-	4
	Total	86	3	-	79
Bidar	M (Marginal)	4	-	-	4
	S (Small)	14	-	-	14
	SM (Semi-medium)	13	-	-	12
	ME (Medium)	7	1	-	5
	L (Large)	5	-	-	2
	Total	43	1	-	37
Dharwad	M (Marginal)	10	-	-	10
	S(Small)	16	-	-	16
	SM (Semi-medium)	19	-	-	19
	ME (Medium)	15	-	-	11
	L (Large)	8	-	-	6
	Total	68	-	-	62
Gulbarga	M (Marginal)	16	2	-	18
	S (Small)	64	7	-	62
	SM (Semi-medium)	55	1	-	55
	ME (Medium)	49	2	-	39
	L (Large)	21	-	-	12
	Total	205	12	-	186
Zone 7: Deccan (telangana) Plateau and Eastern Ghats					
Raichur	M (Marginal)	6	1	-	7
	S (Small)	12	5	-	16
	SM (Semi-medium)	20	6	-	23
	ME (Medium)	6	2	-	4
	L (Large)	3	-	-	1
	Total	47	14	-	51

A6.2.2 Contd./-

A6.2.2 Continued

District	Land holding category	Electricity	Diesel	Kerosene	No of households
Zone 8: Eastern Ghats, TN uplands and Deccan (Karnataka region)					
Mandya	M (Marginal)	8	1	-	9
	S (Small)	11	-	-	10
	SM (Semi-medium)	7	2	-	8
	ME (Medium)	1	-	-	1
	Total	27	3	-	28
Mysore	M (Marginal)	17	-	-	15
	S (Small)	25	-	-	23
	SM (Semi-medium)	19	-	-	16
	ME (Medium)	7	-	-	5
	L (Large)	2	-	-	1
	Total	70	-	-	60
Tumkur	M (Marginal)	5	-	-	5
	S (Small)	12	-	-	12
	SM (Semi-medium)	9	-	-	8
	ME (Medium)	7	-	-	4
	L (Large)	3	-	-	1
	Total	36	-	-	30
Zone 19: Western Ghats and coastal plains					
Coorg	S (Small)	-	1	-	1
	SM (Semi-medium)	1	8	-	9
	ME (Medium)	6	9	-	11
	L (Large)	7	9	-	9
	Total	14	27	-	30
Dakshina Kannada	M (Marginal)	47	2	1	45
	S (Small)	12	-	5	14
	SM (Semi-medium)	8	1	1	6
	ME (Medium)	1	-	-	1
	Total	68	3	7	66

A6.3 Distribution of pumpset ownership in Haryana

Pump1	Pump2	Pump3	Pump4	No of households
Electric	Electric	Electric	Electric	4
Electric	Electric	Electric	Diesel	2
Electric	Electric	Diesel	Diesel	7
Electric	Diesel	Diesel	Diesel	3
Diesel	Diesel	Diesel	Diesel	7
Electric	Electric	Electric		3
Electric	Electric	Diesel		8
Electric	Diesel	Diesel		7
Diesel	Diesel	Diesel		13
Electric	Electric			29
Electric	Diesel			70
Diesel	Diesel			50
Electric				260
Diesel				232

A6.4 Distribution of pumpset ownership in Karnataka

Pump1	Pump2	Pump3	Pump4	No of households
Electric	Electric	Electric	Electric	2
Electric	Electric	Electric	Diesel	2
Electric	Electric	Diesel	Diesel	1
Electric	Electric	Electric		10
Electric	Electric	Diesel		2
Electric	Diesel	Diesel		1
Electric	Kerosene	Kerosene		1
Electric	Electric			71
Electric	Diesel			10
Electric	Kerosene			1
Diesel	Diesel			2
Electric				662
Diesel				41
Kerosene				4

A6.5 Current availability and extra demand of power for irrigation in Haryana (hours/day)

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	No of days electricity used: khanf	Hours of electncity available: Rabi	Extra hours electricity required: Rabi	No of days electricity used: Rabi	Hours of electricity available: Summers	Extra hours electricity required: Summers	No of days electncity used: Summers	Hours of electncity available· Annually	Extra hours electricity required: Annually
N	375	375	375	375	375	375	375	375	375	375	375
Mean	6.0	10.5	79.9	6.7	4.7	38.3	0.7	0.9	2.1	0.2	0.2
Std. Deviation	2.3	5.9	108.3	2.3	4.8	52.5	2.0	2.9	10.0	0.9	1.2
Median	6.0	12.0	50.0	6.0	4.0	25.0	0.0	0.0	0.0	0.0	0.0
Maximum	16.0	22.0	950.0	20.0	20.0	500.0	10.0	18.0	100.0	8.0	11.0
Minimum	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

A6.5.1 Current availability and extra demand of power for irrigation by zones in Haryana

Zone 2: Western plain, Kutch and part of the Kathiawar peninsula

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required: Summers	Hours of electricity available: Annually	Extra hours electncity required. Annually
N	109	109	109	109	-	-	-	-
Mean	5.9	7.2	7.1	7.2	-	-	-	-
Std. Deviation	2.0	6.4	1.5	5.2	-	-	-	-
Median	6.0	6.0	8.0	6.0	-	-	-	-
Maximum	10.0	20.0	12.0	18.0	-	-	-	-
Minimum	0.0	0.0	0.0	0.0	-	-	-	-

Zone 4: Northern plains and central high lands including the aravalis

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electncity required: Summers	Hours of electncity available: Annually	Extra hours electncity required: Annually
N	261	261	261	261	261	261	261	261
Mean	5.7	11.6	6.4	3.8	0.7	1.0	0.3	0.3
Std. Deviation	2.5	5.4	2.7	4.2	1.9	3.1	1.1	1.5
Median	6.0	12.0	6.0	3.0	0.0	0.0	0.0	0.0
Maximum	16.0	22.0	20.0	20.0	10.0	18	8	11
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Zone 9: Northern plain, hot sub-humid (dry) region

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electncity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required: Summers	Hours of electncity available: Annually	Extra hours electricity required: Annually
N	23	23	23	23	23	23	23	23
Mean	7.3	14.4	7.9	1.8	3.2	3.1	0.4	0.7
Std. Deviation	2.3	3.8	2.2	3.0	4.6	4.9	1.4	2.3
Median	6.0	14.0	8.0	0.0	0.0	0.0	0.0	0.0
Maximum	10.0	20.0	12.0	9.0	10.0	14.0	5.0	8.0
Minimum	4.0	10.0	5.0	0.0	0.0	0.0	0.0	0.0

A6.5.1 Contd./

A6.5.1 Continued

Zone 14: Western himalayas, warm sub-humid region

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required: Summers	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	393	393	393	393	393	393	393	393
Mean	5.9	10.5	6.7	4.6	0.6	0.9	0.2	0.3
Std. Deviation	2.4	6.0	2.4	4.7	2.0	2.9	1.0	1.3
Median	6.0	12.0	6.0	4.0	0.0	0.0	0.0	0.0
Maximum	16.0	22.0	20.0	20.0	10.0	18.0	8.0	11.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

A6.5.2 Current availability and extra demand of power for irrigation in Haryana

Zone 2: Western plain, Kutch and part of the Kathiawar pennisula

Bhiwani

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required: Summers	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	1	1	1	1	-	-	-	-
Mean	6.0	0.0	6.0	12.0	-	-	-	-
Std. Deviation	-	-	-	-	-	-	-	-
Median	6.0	0.0	6.0	12	-	-	-	-
Maximum	6.0	0.0	6.0	12	-	-	-	-
Minimum	6.0	0.0	6.0	12	-	-	-	-

Mahendergarh

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required: Summers	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	71	71	71	71	-	-	-	-
Mean	6.3	4.8	7.6	8.7	-	-	-	-
Std. Deviation	2.3	5.9	1.6	5.1	-	-	-	-
Median	8.0	4.0	8.0	8.0	-	-	-	-
Maximum	10	18	12	18	-	-	-	-
Minimum	0.0	0.0	0.0	0.0	-	-	-	-

A6.5.2 Contd./-

A6.5.2 Continued

Sirsa

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required:	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	37	37	37	37	-	-	-	-
Mean	5.2	11.8	6.3	4.1	-	-	-	-
Std. Deviation	1.2	4.7	1.0	4.1	-	-	-	-
Median	5.0	10.0	6.0	4.0	-	-	-	-
Maximum	8.0	20.0	8.0	14.0	-	-	-	-
Minimum	3.0	4.0	4.0	0.0	-	-	-	-

Zone 4: Northern plains and central high lands including the aravalis

Faridabad

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required:	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	18	18	18	18	18	18	18	18
Mean	5.3	7.0	5.3	6.8	3.1	3.9	0.3	0.6
Std. Deviation	1.9	3.6	1.9	4.0	3.2	5.4	1.0	1.7
Median	6.0	8.0	6.0	6.0	2.7	0.0	0.0	0.0
Maximum	8.0	16.0	8.0	16.0	8.0	16.0	4.0	6.0
Minimum	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0

Kaithal

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required. Rabi	Hours of electricity available Summers	Extra hours electricity required.	Hours of electricity available Annually	Extra hours electricity required: Annually
N	97	97	97	97	97	97	97	97
Mean	5.3	14.4	6.3	2.8	0.2	0.4	0.1	0.1
Std Deviation	1.8	4.0	1.6	3.8	1.1	1.8	0.7	0.6
Median	5.0	15.0	6.0	2.0	0.0	0.0	0.0	0.0
Maximum	10.0	22.0	10.0	18.0	6.0	12.0	6.0	6.0
Minimum	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0

Kurukshetra

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available Annually	Extra hours electricity required. Annually
N	53	53	53	53	53	53	-	-
Mean	8.4	11.3	8.8	1.3	0.3	0.4	-	-
Std Deviation	2.5	5.7	2.5	2.8	1.7	1.9	-	-
Median	8.0	12.0	8.0	0.0	0.0	0.0	-	-
Maximum	12.0	22.0	14.0	12.0	10.0	10.0	-	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-	-

A6.5.2 Contd./-

A6.5.2 Continued

Panipat

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	58	58	58	58	58	58	58	58
Mean	5.0	10.1	5.3	4.9	0.6	1.0	0.1	0.1
Std Deviation	2.5	4.6	3.0	4.2	1.6	3.2	0.6	0.8
Median	4.0	10.0	4.0	5.0	0.0	0.0	0.0	0.0
Maximum	16.0	20.0	20.0	16.0	8.0	18.0	3.0	6.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Rewari

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	14	14	14	14	14	14	14	14
Mean	3.7	4.1	3.6	5.7	1.7	3.6	1.6	2.9
Std Deviation	0.5	3.9	0.6	1.9	2.1	4.9	2.0	3.9
Median	4.0	5.5	4.0	5.0	0.0	0.0	0.0	0.0
Maximum	4.0	9.0	4.0	9.0	5.0	14.0	4.0	11.0
Minimum	2.5	0.0	2.5	4.0	0.0	0.0	0.0	0.0

Sonipat

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	21	21	21	21	21	21	21	21
Mean	4.9	12.5	6.0	7.4	1.1	1.5	1.1	0.9
Std Deviation	2.5	6.1	3.1	4.7	2.4	3.5	2.4	2.5
Median	4.0	12.0	6.0	8.0	0.0	0.0	0.0	0.0
Maximum	12.0	22.0	16.0	20.0	8.0	12.0	8.0	10.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Zone 9: Northern plain, hot sub-humid (dry) region

Kurukshetra

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	13	13	13	13	13	13	13	13
Mean	5.5	17.3	6.2	3.2	0.4	0.0	0.8	1.2
Std Deviation	0.8	2.2	0.9	3.5	1.4	0.0	1.9	3.0
Median	6.0	18.0	6.0	2.0	0.0	0.0	0.0	0.0
Maximum	6.0	20.0	8.0	9.0	5.0	0.0	5.0	8.0
Minimum	4.0	13.0	5.0	0.0	0.0	0.0	0.0	0.0

A6.5.2 Contd./-

A6.5.2 Continued

Yamuna Nagar

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually	Extra hours electricity required: Annually
N	10	10	10	10	10	10	-	-
Mean	9.8	10.6	10.2	0.0	6.8	7.2	-	-
Std Deviation	0.6	1.0	0.6	0.0	4.7	5.2	-	-
Median	10.0	10.0	10.0	0.0	10.0	10.0	-	-
Maximum	10.0	12.0	12.0	0.0	10.0	14.0	-	-
Minimum	8.0	10.0	10.0	0.0	0.0	0.0	-	-

A6.6 Current availability and extra demand of power for irrigation in Karnataka

Statistics	Hours o electricity available Khan	Extra hour electricit required Khari	No of days electricity used: Khanf	Hours o electricity available Rabi	Extra hour electricity required Rabi	No of days electricity used: Rabi	Hours o electricit available Summer	Extra hour electricity required Summers	No of days electricity used Summers	Hours o electricity available Annually	Extra hour electricity required Annually
N	681	68	681	681	681	681	68	681	681	681	-
Mean	12.9	2.	17.9	9.5	5.7	51.0	7.	8.5	50.5	0.0	-
Std. Deviation	6.5	3.	27.3	5.4	5.2	44.1	4.	6.2	54.9	0.4	-
Median	12.0	0.	7.5	8.0	5.0	40.0	6.	8.0	33.8	0.0	-
Maximum	24.0	24.	180.0	24.0	22.0	270.0	22.	22.0	384.0	8.0	-
Minimum	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0	0.0	0.0	-

A6.6.1 Current availability and extra demand of power for irrigation by ecological zone in Karnataka

Zone 3 : Deccan Plateau, hot-arid region

Statistics	Hours of electricity available: Khanf	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available Summers	Extra hours electricity required	Hours of electricity available: Annually
N	183	183	183	183	183	183	183
Mean	12.6	2.1	11.2	4.0	8.3	7.2	0.0
Std Deviation	7.7	3.6	7.0	5.1	5.8	6.5	0.0
Median	12.0	0.0	12.0	2.0	7.0	6.0	0.0
Maximum	24.0	18.0	24.0	18.0	22	22.0	0.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Zone 6 : Deccan Plateau, semi-arid region

Statistics	Hours of electricity available: Khanf	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available. Summers	Extra hours electricity required	Hours of electricity available Annually
N	352	352	352	352	352	352	352
Mean	10.7	2.1	6.8	6.3	5.3	8.4	0.0
Std Deviation	7.1	3.6	4.3	5.2	3.6	6.3	0.5
Median	10.0	0.0	6.0	6.0	5.0	7.0	0.0
Maximum	24.0	20.0	22.0	22.0	20.0	22.0	8.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0

A6.6.1 Contd./-

A6.6.1 Continued

Zone 7 : Deccan (Telangana) Plateau and Eastern Ghats

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	41	41	41	41	41	41	-
Mean	7.7	2.0	5.9	3.2	4.7	4.6	-
Std Deviation	4.9	3.2	3.8	3.5	3.4	5.2	-
Median	8.0	0.0	5.0	2.0	4.0	3.0	-
Maximum	22.0	14.0	14.0	16.0	16.0	22.0	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

Zone 8: Eastern Ghats, TN uplands and Deccan (Karnataka region)

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours electricity required: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	116	116	116	116	116	116	-
Mean	13.5	2.1	9.0	6.7	7.0	10.6	-
Std Deviation	6.2	3.8	4.8	5.1	3.7	6.0	-
Median	14.5	0.0	8.0	6.0	6.0	10.0	-
Maximum	24.0	16.0	21.0	20.0	20.0	22.0	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

Zone 19 : Western Ghats and coastal plains

Statistics	Hours of electricity available: Kharif	Extra hours electricity required: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	66	66	66	66	66	66	-
Mean	14.7	0.4	13.2	1.3	10.7	3.5	-
Std Deviation	7.4	3.0	6.1	2.9	5.3	5.0	-
Median	18.0	0.0	15.0	0.0	12.0	0.0	-
Maximum	24.0	24.0	22.0	14.0	22.0	24.0	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

A6.6.2 Current availability and extra demand of power for irrigation by ecological zone by district within each zone in Karnataka

Belgaum

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	76	76	76	76	76	76	-
Mean	15.0	1.6	8.3	8.7	6.9	10.3	-
Std Deviation	6.7	3.2	4.1	5.8	3.7	5.9	-
Median	18	0.0	8	8	6	9.5	-
Maximum	24	12	20	20	16	20	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

A6.6.2 Contd./-

A6.6.2 Continued

Bellary

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	115	115	115	115	115	115	115
Mean	12.2	1.9	11.0	3.5	8.5	6.3	0.0
Std Deviation	8.3	4.0	7.7	5.2	6.1	6.6	0.0
Median	12	0.0	12	0.0	8	6	0.0
Maximum	24	18	24	18	22	22	0.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Bidar

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available Summers	Extra hours electricity required	Hours of electricity available Annually
N	36	36	36	36	36	36	36
Mean	6.7	1.3	6.5	2.0	5.3	3.8	0.4
Std Deviation	5.5	1.9	5.4	2.6	4.8	4.6	1.6
Median	6.5	0.0	6.0	2.0	4.5	3.0	0.0
Maximum	20.0	8.0	20.0	12.0	20.0	20.0	8.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Chitradurga

Statistics	Hours of electricity available. Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available. Summers	Extra hours electricity required	Hours of electricity available Annually
N	68	68	68	68	68	68	-
Mean	13.2	2.5	11.4	5.0	7.9	8.8	-
Std Deviation	6.5	3.0	5.8	5.0	5.4	6.0	-
Median	12.0	0.5	10.0	4.0	6.0	8.0	-
Maximum	24.0	14.0	22.0	18.0	20.0	22.0	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

Coorg

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available. Summers	Extra hours electricity required	Hours of electricity available. Annually
N	12	12	12	12	12	12	-
Mean	14.8	2.0	15.1	2.9	12.1	6.6	-
Std Deviation	7.3	6.9	5.4	5.4	3.8	6.5	-
Median	17.0	0.0	15.0	0.0	13.0	7.5	-
Maximum	24.0	24.0	22.0	14.0	16.0	18.0	-
Minimum	0.0	0.0	3.0	0.0	4.0	0.0	-

A6.6.2 Contd./-

A6.6.2 Continued

Dakshina Kanada

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	54	54	54	54	54	54	-
Mean	14.6	0.1	12.8	1.0	10.4	2.8	-
Std Deviation	7.5	0.7	6.3	1.9	5.6	4.4	-
Median	18.0	0.0	15.0	0.0	12.0	0.0	-
Maximum	24.0	5.0	20.0	6.0	22.0	24.0	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

Dharwad

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	62	62	62	62	62	62	-
Mean	14.2	0.8	6.9	7.5	5.9	8.7	-
Std Deviation	5.5	2.6	3.8	5.5	3.3	5.7	-
Median	15	0.0	6	6	5	8	-
Maximum	24	16	18	22	16	20	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

Gulbarga

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	178	178	178	178	178	178	-
Mean	8.5	2.9	6.2	5.8	4.4	8.4	-
Std Deviation	6.6	4.2	4.2	4.6	3.2	6.6	-
Median	6.0	0.0	6.0	6.0	4.0	6.5	-
Maximum	24.0	20.0	22.0	18.0	18.0	22.0	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

Mandya

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	26	26	26	26	26	26	-
Mean	15.8	0.2	9.0	5.0	6.5	9.6	-
Std Deviation	6.3	0.8	5.2	4.3	3.4	7.0	-
Median	16.0	0.0	7.0	5.0	6.0	8.0	-
Maximum	24.0	4.0	20.0	18.0	14.0	22.0	-
Minimum	5.0	0.0	3.0	0.0	1.0	0.0	-

A6.6.2 Contd./-

A6.6.2 Continued

Mysore

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	60	60	60	60	60	60	-
Mean	11.2	3.7	8.4	8.0	6.8	11.7	-
Std Deviation	5.7	4.6	3.7	5.0	3.1	5.5	-
Median	12	2.5	8	6	6	10	-
Maximum	24	16	16	20	12	22	-
Minimum	0.0	0.0	0.0	0.0	2	3	-

Raichur

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available Annually
N	41	41	41	41	41	41	-
Mean	7.7	2.0	5.9	3.2	4.7	4.6	-
Std Deviation	4.9	3.2	3.8	3.5	3.4	5.2	-
Median	8	0.0	5	2	4	3	-
Maximum	22	14	14	16	16	22	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

Tumkur

Statistics	Hours of electricity available: Kharif	Extra hours of electricity available: Kharif	Hours of electricity available: Rabi	Extra hours of electricity available: Rabi	Hours of electricity available: Summers	Extra hours electricity required	Hours of electricity available: Annually
N	30	30	30	30	30	30	-
Mean	16.0	0.6	10.3	5.8	8.1	9.5	-
Std Deviation	5.7	1.7	6.1	5.5	4.9	6.1	-
Median	18.0	0.0	10.0	4.5	6.0	10.0	-
Maximum	24.0	6.0	21.0	16.0	20.0	22.0	-
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	-

A6.7 Magnitude of power problems in Haryana

Problems	Mean Score
Voltage fluctuation	4.4
Frequency fluctuation	2.5
Scheduled outages	0.7
Unscheduled outages	3.1
Demand cut	1.5
No response to complaints	3.5
Unofficial payments required	2.5
Getting new connection difficult	3.7
Other	0.7

A6.7.1 Magnitude of power problems by zones in Haryana

Zone 2: Western plain, Kutch and part of Kathiawar peninsula	
Problems	Mean Score
Voltage fluctuation	4.6
Frequency fluctuation	2.7
Scheduled outages	0.7
Unscheduled outages	3.2
Demand cut	1.2
No response to complaints	3.5
Unofficial payments required	1.9
Getting new connection difficult	3.6
Other	0.8

Zone 4: Northern plain and Central high lands including Aravalis	
Problems	Mean Score
Voltage fluctuation	4.3
Frequency fluctuation	2.4
Scheduled outages	0.7
Unscheduled outages	3.1
Demand cut	1.6
No response to complaints	3.5
Unofficial payments required	2.6
Getting new connection difficult	3.7
Other	0.8

Zone 9: Nothern plain, hot sub-humid (dry) region	
Problems	Mean Score
Voltage fluctuation	4.8
Frequency fluctuation	1.6
Scheduled outages	0.7
Unscheduled outages	2.7
Demand cut	2.3
No response to complaints	3.9
Unofficial payments required	3.4
Getting new connection difficult	4.7
Other	0.0

A6.7.2 Magnitude of power problems by districts within each zone in Haryana

Zone 2:Western plain, Kutch and part of Kathiawar peninsula
District: Bhiwani

Problems	Mean Score
Voltage fluctuation	5.0
Frequency fluctuation	5.0
Scheduled outages	0.0
Unscheduled outages	5.0
Demand cut	5.0
No response to complaints	2.0
Unofficial payments required	2.0
Getting new connection difficult	5.0
Other	0.0

District: Mahendargarh

Problems	Mean Score
Voltage fluctuation	4.7
Frequency fluctuation	2.7
Scheduled outages	0.9
Unscheduled outages	2.6
Demand cut	1.2
No response to complaints	3.4
Unofficial payments required	1.8
Getting new connection difficult	3.3
Other	1.1

District: Sirsa

Problems	Mean Score
Voltage fluctuation	4.5
Frequency fluctuation	2.8
Scheduled outages	0.4
Unscheduled outages	4.3
Demand cut	0.9
No response to complaints	3.7
Unofficial payments required	2.1
Getting new connection difficult	3.9
Other	0.3

A6.7.2 Contd./-

A6.7.2 Continued

Zone 4: Northern plain and central high lands including the aravalis

District: Kaithal

Problems	Mean Score
Voltage fluctuation	4.5
Frequency fluctuation	2.1
Scheduled outages	0.8
Unscheduled outages	3.1
Demand cut	1.6
No response to complaints	3.7
Unofficial payments required	2.8
Getting new connection difficult	3.9
Other	1.1

District: Kurukshetra

Problems	Mean Score
Voltage fluctuation	4.4
Frequency fluctuation	2.8
Scheduled outages	0.6
Unscheduled outages	2.4
Demand cut	2.1
No response to complaints	3.4
Unofficial payments required	2.7
Getting new connection difficult	4.3
Other	0.0

District: Panipat

Problems	Mean Score
Voltage fluctuation	4.1
Frequency fluctuation	1.7
Scheduled outages	0.9
Unscheduled outages	3.5
Demand cut	1.2
No response to complaints	3.8
Unofficial payments required	2.8
Getting new connection difficult	3.7
Other	1.1

District: Rewari

Problems	Mean Score
Voltage fluctuation	4.2
Frequency fluctuation	2.6
Scheduled outages	0.0
Unscheduled outages	4.6
Demand cut	3.9
No response to complaints	2.7
Unofficial payments required	4.0
Getting new connection difficult	3.6
Other	0.4

A6.7.2 Contd./-

A6.7.2 Continued

District : Sonipat	
Problems	**Mean Score**
Voltage fluctuation	4.3
Frequency fluctuation	3.7
Scheduled outages	0.8
Unscheduled outages	3.0
Demand cut	0.9
No response to complaints	2.5
Unofficial payments required	1.1
Getting new connection difficult	2.7
Other	0.9

District : Faridabad	
Problems	**Mean Score**
Voltage fluctuation	4.1
Frequency fluctuation	3.5
Scheduled outages	0.0
Unscheduled outages	2.9
Demand cut	1.1
No response to complaints	2.8
Unofficial payments required	1.6
Getting new connection difficult	1.9
Other	0.5

Zone 9: Northern plain, hot sub-humid (dry) region	
District : Kurukshetra	
Problems	**Mean Score**
Voltage fluctuation	4.9
Frequency fluctuation	2.8
Scheduled outages	1.3
Unscheduled outages	4.1
Demand cut	4.2
No response to complaints	3.2
Unofficial payments required	3.0
Getting new connection difficult	4.9
Other	0.0

District : Yamuna Nagar	
Problems	**Mean Score**
Voltage fluctuation	4.6
Frequency fluctuation	0.0
Scheduled outages	0.0
Unscheduled outages	0.8
Demand cut	0.0
No response to complaints	4.8
Unofficial payments required	3.9
Getting new connection difficult	4.5
Other	0.0

A6.8 Magnitude of power problems in Karnataka

Problems	Mean Score
Voltage fluctuation	3.1
Frequency fluctuation	0.0
Scheduled outages	0.1
Unscheduled outages	3.7
Demand cut	0.1
No response to complaints	1.2
Unofficial payments required	0.8
Getting new connection difficult	0.1
Other	0.1

A6.8.1 Magnitude of power problems by zones in Karnataka

Zone 3: Deccan Plateau, hot-arid region	
Problems	Mean Score
Voltage fluctuation	2.5
Frequency fluctuation	0.0
Scheduled outages	0.0
Unscheduled outages	3.1
Demand cut	0.0
No response to complaints	0.7
Unofficial payments required	0.8
Getting new connection difficult	0.1
Other	0.1

Zone 6: Deccan Plateau, semi-arid region	
Problems	Mean Score
Voltage fluctuation	3.3
Frequency fluctuation	0.0
Scheduled outages	0.2
Unscheduled outages	3.9
Demand cut	0.1
No response to complaints	1.1
Unofficial payments required	0.7
Getting new connection difficult	0.2
Other	0.2

Zone 7: Deccan (Telangana) Plateau and Eastern Ghats	
Problems	Mean Score
Voltage fluctuation	2.7
Frequency fluctuation	0.0
Scheduled outages	0.1
Unscheduled outages	3.7
Demand cut	0.1
No response to complaints	1.4
Unofficial payments required	0.6
Getting new connection difficult	0.0
Other	0.0

A6.8.1 Contd./-

A6.8.1 Continued

Zone 8: Eastern Ghats, TN uplands and Deccan (Karnataka region)	
Problems	**Mean Score**
Voltage fluctuation	4.0
Frequency fluctuation	0.0
Scheduled outages	0.1
Unscheduled outages	4.3
Demand cut	0.0
No response to complaints	2.3
Unofficial payments required	1.6
Getting new connection difficult	0.1
Other	0.0

Zone 19: Western Ghats and coastal plains	
Problems	**Mean Score**
Voltage fluctuation	2.2
Frequency fluctuation	0.0
Scheduled outages	0.0
Unscheduled outages	3.2
Demand cut	0.0
No response to complaints	0.9
Unofficial payments required	0.3
Getting new connection difficult	0.0
Other	0.0

A6.8.2 Magnitude of power problems by districts within each zone Karnataka

Zone 3: Deccan Plateau, hot-arid region District : Bellary	
Problems	**Mean Score**
Voltage fluctuation	1.9
Frequency fluctuation	0.0
Scheduled outages	0.0
Unscheduled outages	2.7
Demand cut	0.0
No response to complaints	0.5
Unofficial payments required	0.7
Getting new connection difficult	0.1
Other	0.0

District : Chitradurga	
Problems	**Mean Score**
Voltage fluctuation	3.6
Frequency fluctuation	0.0
Scheduled outages	0.0
Unscheduled outages	3.7
Demand cut	0.0
No response to complaints	1.0
Unofficial payments required	0.9
Getting new connection difficult	0.1
Other	0.2

A6.8.2 Contd./

A6.8.2 Continued

Zone 6: Deccan Plateau, semi-arid region

District : Belgaum

Problems	Mean Score
Voltage fluctuation	3.9
Frequency fluctuation	0.0
Scheduled outages	0.1
Unscheduled outages	4.4
Demand cut	0.1
No response to complaints	1.6
Unofficial payments required	1.0
Getting new connection difficult	0.2
Other	0.1

District : Bidar

Problems	Mean Score
Voltage fluctuation	1.1
Frequency fluctuation	0.1
Scheduled outages	0.5
Unscheduled outages	2.0
Demand cut	0.1
No response to complaints	0.5
Unofficial payments required	0.6
Getting new connection difficult	0.0
Other	0.1

District : Dharwad

Problems	Mean Score
Voltage fluctuation	4.1
Frequency fluctuation	0.0
Scheduled outages	0.0
Unscheduled outages	4.4
Demand cut	0.1
No response to complaints	0.9
Unofficial payments required	0.5
Getting new connection difficult	0.0
Other	0.3

District : Gulbarga

Problems	Mean Score
Voltage fluctuation	3.2
Frequency fluctuation	0.1
Scheduled outages	0.2
Unscheduled outages	3.8
Demand cut	0.1
No response to complaints	1.2
Unofficial payments required	0.7
Getting new connection difficult	0.3
Other	0.2

A6.8.2 Contd./-

A6.8.2 Continued

Zone 7: Deccan (Telangana) Plateau and Eastern Ghats

District : Raichur

Problems	Mean Score
Voltage fluctuation	2.7
Frequency fluctuation	0.0
Scheduled outages	0.1
Unsceduled outages	3.7
Demand cut	0.1
No response to complaints	1.4
Unofficial payments required	0.6
Getting new connection difficult	0.0
Other	0.0

Zone 8: Eastern Ghats, TN uplands and Deccan (Karnataka region)

District : Mandya

Problems	Mean Score
Voltage fluctuation	4.0
Frequency fluctuation	0.0
Scheduled outages	0.0
Unsceduled outages	4.6
Demand cut	0.0
No response to complaints	2.0
Unofficial payments required	1.0
Getting new connection difficult	0.0
Other	0.0

District : Mysore

Problems	Mean Score
Voltage fluctuation	4.2
Frequency fluctuation	0.0
Scheduled outages	0.1
Unscheduled outages	4.4
Demand cut	0.1
No response to complaints	2.4
Unofficial payments required	1.9
Getting new connection difficult	0.1
Other	0.0

District : Tumkur

Problems	Mean Score
Voltage fluctuation	3.8
Frequency fluctuation	0.0
Scheduled outages	0.2
Unscheduled outages	3.8
Demand cut	0.0
No response to complaints	2.4
Unofficial payments required	1.5
Getting new connection difficult	0.0
Other	0.0

A6.8.2 Contd./

A6.8.2 Continued

Zone 19: Western Ghats and coastal plains

District : Coorg

Problems	Mean Score
Voltage fluctuation	3.9
Frequency fluctuation	0.0
Scheduled outages	0.0
Unscheduled outages	4.5
Demand cut	0.0
No response to complaints	2.2
Unofficial payments required	0.3
Getting new connection difficult	0.0
Other	0.0

District : Dakshina Kanada

Problems	Mean Score
Voltage fluctuation	1.9
Frequency fluctuation	0.0
Scheduled outages	0.0
Unscheduled outages	2.9
Demand cut	0.0
No response to complaints	0.6
Unofficial payments required	0.3
Getting new connection difficult	0.0
Other	0.0

ANNEX 7

CUE ESTIMATES IN INDUSTRY

Method 1

A7.1 Average weighted[1] cost of production loss per unit of electricity not available in Haryana (Rs/kWh)

Statistics	HT	LT	Total
N	146	99	245
Mean	5.24	6.19	5.26
Standard Deviation	13.53	12.59	13.51
Median	1.67	1.68	1.67
Maximum	269.50	141.94	269.50
Minimum	0.03	0.06	0.03

A7.1.1 Average weighted cost of production loss per unit of electricity not available in LT industries in Haryana (Rs/kWh)

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0 - 20	20 - 40	40 - 80	> 80	Total
1	Grid	N	6	4	1	-	11
		Mean	3.07	11.81	23.27	-	10.25
		Std. Deviation	4.16	5.31	0.00	-	8.01
		Median	0.67	14.91	23.27	-	9.81
		Maximum	9.81	15.75	23.27	-	23.27
		Minimum	0.08	1.68	23.27	-	0.08
	Captive & Grid	N	2	27	11	7	47
		Mean	0.89	10.44	4.59	7.92	7.77
		Std. Deviation	0.32	16.23	13.13	11.27	13.77
		Median	1.07	2.62	0.58	2.51	1.58
		Maximum	1.07	68.17	57.88	32.23	68.17
		Minimum	0.33	0.06	0.17	0.28	0.06
	All together	N	8	31	12	7	58
		Mean	2.51	10.58	5.27	7.92	7.94
		Std. Deviation	3.71	15.50	13.36	11.27	13.46
		Median	0.67	2.64	0.58	2.51	1.80
		Maximum	9.81	68.17	57.88	32.23	68.17
		Minimum	0.08	0.06	0.17	0.28	0.06
2	Grid	N	2	6	1	1	10
		Mean	0.41	1.54	0.08	1.87	1.30
		Std. Deviation	1.44	1.17	0.00	0.00	1.07
		Median	0.10	0.96	0.08	1.87	1.12

A7.1.1 Contd./-

[1] Weighted by kWh of electricity consumed from the grid.

A7.1.1 Continued

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0 - 20	20 - 40	40 - 80	> 80	Total
		Maximum	7.06	5.35	0.08	1.87	7.06
		Minimum	0.10	0.34	0.08	1.87	0.08
	Captive & Grid	N	-	11	2	7	20
		Mean	-	17.95	0.48	3.00	5.75
		Std. Deviation	-	29.17	0.23	4.32	15.29
		Median	-	4.18	0.65	1.15	1.15
		Maximum	-	141.94	0.65	12.83	141.94
		Minimum	-	1.01	0.15	0.23	0.15
	All together	N	2	17	3	8	30
		Mean	0.41	11.29	0.36	2.80	4.54
		Std. Deviation	1.44	23.89	0.27	3.94	13.20
		Median	0.10	2.05	0.15	1.87	1.12
		Maximum	7.06	141.94	0.65	12.83	141.94
		Minimum	0.10	0.34	0.08	0.23	0.08
3	Grid	N	-	2	-	-	2
		Mean	-	5.01	-	-	5.01
		Std. Deviation	-	1.78	-	-	1.78
		Median	-	6.74	-	-	6.74
		Maximum	-	6.74	-	-	6.74
		Minimum	-	3.17	-	-	3.17
	Captive & Grid	N	-	5	2	2	9
		Mean	-	3.09	4.70	0.28	2.81
		Std. Deviation	-	6.14	1.86	0.09	4.53
		Median	-	0.42	6.38	0.22	0.42
		Maximum	-	20.92	6.38	0.42	20.92
		Minimum	-	0.42	2.63	0.22	0.22
	All together	N	-	7	2	2	11
		Mean	-	4.16	4.70	0.28	3.60
		Std. Deviation	-	4.40	1.86	0.09	3.93
		Median	-	3.17	6.38	0.22	3.17
		Maximum	-	20.92	6.38	0.42	20.92
		Minimum	-	0.42	2.63	0.22	0.22
All shifts	Grid	N	8	12	2	1	23
		Mean	2.20	5.03	5.50	1.87	4.21
		Std. Deviation	3.72	4.34	9.81	0.00	5.15
		Median	0.10	3.17	0.08	1.87	1.87
		Maximum	9.81	15.75	23.27	1.87	23.27
		Minimum	0.08	0.34	0.08	1.87	0.08
	Captive & Grid	N	2	43	15	16	76
		Mean	0.89	10.76	3.78	5.36	6.62
		Std. Deviation	0.32	19.09	10.87	9.00	13.64
		Median	1.07	2.23	0.65	1.57	1.57
		Maximum	1.07	141.94	57.88	32.23	141.94
		Minimum	0.33	0.06	0.15	0.22	0.06

A7.1.1 Contd./-

A7.1.1 Continued

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0 - 20	20 - 40	40 - 80	> 80	Total
	All together	N	10	55	17	17	99
		Mean	1.95	9.09	3.94	5.08	6.19
		Std. Deviation	3.39	16.45	10.78	8.68	12.59
		Median	0.29	2.98	0.61	1.87	1.68
		Maximum	9.81	141.94	57.88	32.23	141.94
		Minimum	0.08	0.06	0.08	0.22	0.06

A7.1.2 Average weighted cost of production loss per unit of electricity not available in HT industries in Haryana (Rs/kWh)

			Contract demand (kVA)				
Shifts	Electricity source	Statistics	< 200	200 - 400	400 - 600	> 600	Total
1	Grid	N	1	1	-	-	2
		Mean	1.07	2.89	-	-	2.73
		Std. Deviation	0.00	0.00	-	-	0.52
		Median	1.07	2.89	-	-	2.89
		Maximum	1.07	2.89	-	-	2.89
		Minimum	1.07	2.89	-	-	1.07
	Captive & Grid	N	10	10	5	-	25
		Mean	19.42	11.53	6.27	-	10.44
		Std. Deviation	33.03	16.02	6.83	-	18.19
		Median	2.18	2.47	3.32	-	3.32
		Maximum	98.27	49.33	19.36	-	98.27
		Minimum	0.03	0.20	1.39	-	0.03
	All together	N	11	11	5	-	27
		Mean	19.04	10.63	6.27	-	10.12
		Std. Deviation	32.79	15.39	6.83	-	17.88
		Median	2.18	2.89	3.32	-	3.32
		Maximum	98.27	49.33	19.36	-	98.27
		Minimum	0.03	0.20	1.39	-	0.03
2	Captive & Grid	N	12	11	10	7	40
		Mean	1.66	1.67	2.44	5.83	3.88
		Std. Deviation	4.60	4.13	3.89	2.51	3.98
		Median	0.11	0.59	0.49	7.68	2.37
		Maximum	25.73	30.19	11.49	7.68	30.19
		Minimum	0.04	0.17	0.10	0.04	0.04
	All together	N	12	11	10	7	40
		Mean	1.66	1.67	2.44	5.83	3.88
		Std. Deviation	4.60	4.13	3.89	2.51	3.98
		Median	0.11	0.59	0.49	7.68	2.37
		Maximum	25.73	30.19	11.49	7.68	30.19
		Minimum	0.04	0.17	0.10	0.04	0.04
3	Grid	N	1	-	-	1	2
		Mean	0.21	-	-	1.31	1.10
		Std. Deviation	0.00	-	-	0.00	0.43
		Median	0.21	-	-	1.31	1.31
		Maximum	0.21	-	-	1.31	1.31
		Minimum	0.21	-	-	1.31	0.21
	Captive & Grid	N	19	18	11	29	77
		Mean	6.48	8.46	9.62	4.56	5.36
		Std. Deviation	35.89	31.80	14.55	7.68	14.75
		Median	0.32	1.04	3.78	1.67	1.67
		Maximum	269.50	177.61	42.42	57.86	269.50
		Minimum	0.16	0.10	0.31	0.06	0.06
	All together	N	20	18	11	30	79
		Mean	6.23	8.46	9.62	4.52	5.31
		Std. Deviation	35.19	31.80	14.55	7.64	14.67

A7.1.2 Continued

A7.1.2 Continued

Shifts	Electricity source	Statistics	Contract demand (kVA)				
			< 200	200 - 400	400 - 600	> 600	Total
		Median	0.32	1.04	3.78	1.67	1.67
		Maximum	269.50	177.61	42.42	57.86	269.50
		Minimum	0.16	0.10	0.31	0.06	0.06
All shifts	Grid	N	2	1	-	1	4
		Mean	0.28	2.89	-	1.31	1.37
		Std. Deviation	0.24	0.00	-	0.00	0.76
		Median	0.21	2.89	-	1.31	1.31
		Maximum	1.07	2.89	-	1.31	2.89
		Minimum	0.21	2.89	-	1.31	0.21
	Captive & Grid	N	41	39	26	36	142
		Mean	5.74	7.30	6.53	4.73	5.28
		Std. Deviation	28.09	26.10	11.19	7.21	13.60
		Median	0.57	1.04	1.47	2.71	1.67
		Maximum	269.50	177.61	42.42	57.86	269.50
		Minimum	0.03	0.10	0.10	0.04	0.03
	All together	N	43	40	26	37	146
		Mean	5.62	7.23	6.53	4.70	5.24
		Std. Deviation	27.78	25.89	11.19	7.18	13.53
		Median	0.47	1.04	1.47	2.71	1.67
		Maximum	269.50	177.61	42.42	57.86	269.50
		Minimum	0.03	0.10	0.10	0.04	0.03

A7.2 Average unweighted cost of production loss per unit of electricity not available in Haryana (Rs/kWh)

Statistics	HT	LT	Total
N	146	99	245
Mean	9.63	7.89	8.93
Std. Deviation	29.17	17.91	25.20
Median	1.91	2.23	2.02
Maximum	269.50	141.94	269.50
Minimum	0.03	0.06	0.03

A.7.2.1 Average unweighted cost of production loss per unit of electricity not available in LT industries in Haryana (Rs/kWh)

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0 - 20	20 - 40	40 - 80	> 80	Total
1	Grid	N	6	4	1	-	11
		Mean	3.93	10.13	23.27	-	7.94
		Std. Deviation	4.52	6.57	-	-	7.63
		Median	2.05	11.55	23.27	-	8.18
		Maximum	9.81	15.75	23.27	-	23.27
		Minimum	0.08	1.68	23.27	-	0.08
	Captive & Grid	N	2	27	11	7	47
		Mean	0.70	8.11	7.25	8.04	7.59

A.7.2.1 Contd./-

A.7.2.1 Continued

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0-20	20-40	40-80	>80	Total
		Std. Deviation	0.52	14.84	16.99	11.29	14.36
		Median	0.70	2.62	1.58	2.51	1.80
		Maximum	1.07	68.17	57.88	32.23	68.17
		Minimum	0.33	0.06	0.17	0.28	0.06
	All together	N	8	31	12	7	58
		Mean	3.12	8.37	8.59	8.04	7.65
		Std. Deviation	4.11	13.99	16.85	11.29	13.29
		Median	0.87	2.64	1.59	2.51	2.41
		Maximum	9.81	68.17	57.88	32.23	68.17
		Minimum	0.08	0.06	0.17	0.28	0.06
2	Grid	N	2	6	1	1	10
		Mean	3.58	1.97	0.08	1.87	2.10
		Std. Deviation	4.92	1.79	-	-	2.33
		Median	3.58	1.39	0.08	1.87	1.39
		Maximum	7.06	5.35	0.08	1.87	7.06
		Minimum	0.10	0.34	0.08	1.87	0.08
	Captive & Grid	N	-	11	2	7	20
		Mean	-	22.20	0.40	3.30	13.41
		Std. Deviation	-	42.23	0.35	4.61	32.34
		Median	-	4.18	0.40	1.15	2.27
		Maximum	-	141.94	0.65	12.83	141.94
		Minimum	-	1.01	0.15	0.23	0.15
	All together	N	2	17	3	8	30
		Mean	3.58	15.06	0.29	3.12	9.64
		Std. Deviation	4.92	34.86	0.31	4.30	26.76
		Median	3.58	2.42	0.15	1.51	1.76
		Maximum	7.06	141.94	0.65	12.83	141.94
		Minimum	0.10	0.34	0.08	0.23	0.08
3	Grid	N	-	2	-	-	2
		Mean	-	4.95	-	-	4.95
		Std. Deviation	-	2.52	-	-	2.52
		Median	-	4.95	-	-	4.95
		Maximum	-	6.74	-	-	6.74
		Minimum	-	3.17	-	-	3.17
	Captive & Grid	N	-	5	2	2	9
		Mean	-	5.71	4.50	0.32	4.24
		Std. Deviation	-	8.56	2.65	0.14	6.54
		Median	-	2.23	4.50	0.32	2.23
		Maximum	-	20.92	6.38	0.42	20.92
		Minimum	-	0.42	2.63	0.22	0.22
	All together	N	-	7	2	2	11
		Mean	-	5.49	4.50	0.32	4.37
		Std. Deviation	-	7.08	2.65	0.14	5.91
		Median	-	3.17	4.50	0.32	2.63
		Maximum	-	20.92	6.38	0.42	20.92
		Minimum	-	0.42	2.63	0.22	0.22

A.7.2.1 Contd./-

A.7.2.1 Continued

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0 - 20	20 - 40	40 - 80	> 80	Total
All shifts	Grid	N	8	12	2	1	23
		Mean	3.84	5.19	11.67	1.87	5.14
		Std. Deviation	4.25	5.33	16.39	.-	6.09
		Median	2.05	2.79	11.67	1.87	2.42
		Maximum	9.81	15.75	23.27	1.87	23.27
		Minimum	0.08	0.34	0.08	1.87	0.08
	Captive & Grid	N	2	43	15	16	76
		Mean	0.70	11.44	5.97	5.00	8.72
		Std. Deviation	0.52	24.69	14.59	8.25	20.13
		Median	0.70	2.64	1.58	1.95	2.14
		Maximum	1.07	141.94	57.88	32.23	141.94
		Minimum	0.33	0.06	0.15	0.22	0.06
	All together	N	10	55	17	17	99
		Mean	3.21	10.08	6.64	4.82	7.89
		Std. Deviation	3.98	22.06	14.37	8.02	17.91
		Median	0.87	2.64	1.58	1.87	2.23
		Maximum	9.81	141.94	57.88	32.23	141.94
		Minimum	0.08	0.06	0.08	0.22	0.06

A7.2.2 Average unweighted cost of production loss per unit of electricity not available in HT industries in Haryana (Rs/kWh)

Shifts	Electricity source	Statistics	Contract demand (kVA)				
			< 200	200 - 400	400 - 600	> 600	Total
1	Grid	N	1	1	-	-	2
		Mean	1.07	2.89	-	-	1.98
		Std. Deviation	-	-	-	-	1.29
		Median	1.07	2.89	-	-	1.98
		Maximum	1.07	2.89	-	-	2.89
		Minimum	1.07	2.89	-	-	1.07
	Captive & Grid	N	10	10	5	-	25
		Mean	22.01	10.34	6.90	-	14.32
		Std. Deviation	35.22	16.81	7.23	-	24.95
		Median	2.85	2.35	3.60	-	3.32
		Maximum	98.27	49.33	19.36	-	98.27
		Minimum	0.03	0.20	1.39	-	0.03
	All together	N	11	11	5	-	27
		Mean	20.11	9.66	6.90	-	13.41
		Std. Deviation	34.00	16.11	7.23	-	24.20
		Median	2.18	2.47	3.60	-	2.89
		Maximum	98.27	49.33	19.36	-	98.27
		Minimum	0.03	0.20	1.39	-	0.03
2	Captive & Grid	N	12	11	10	7	40
		Mean	4.96	3.85	2.84	3.33	3.84
		Std. Deviation	8.03	8.79	4.48	2.47	6.65
		Median	1.04	1.07	0.60	2.71	1.11

A7.2.2 Contd./-

A7.2.2 Continued

Shifts	Electricity source	Statistics	Contract demand (kVA)				
			<200	200-400	400-600	>600	Total
		Maximum	25.73	30.19	11.49	7.68	30.19
		Minimum	0.04	0.17	0.10	0.04	0.04
	All together	N	12	11	10	7	40
		Mean	4.96	3.85	2.84	3.33	3.84
		Std. Deviation	8.03	8.79	4.48	2.47	6.65
		Median	1.04	1.07	0.60	2.71	1.11
		Maximum	25.73	30.19	11.49	7.68	30.19
		Minimum	0.04	0.17	0.10	0.04	0.04
3	Grid	N	1	-	-	1	2
		Mean	0.21	-	-	1.31	0.76
		Std. Deviation	.	-	-	-	0.78
		Median	0.21	-	-	1.31	0.76
		Maximum	0.21	-	-	1.31	1.31
		Minimum	0.21	-	-	1.31	0.21
	Captive & Grid	N	19	18	11	29	77
		Mean	17.77	14.16	7.49	7.38	11.55
		Std. Deviation	61.42	41.45	12.19	12.09	37.03
		Median	1.56	1.08	3.78	3.18	2.02
		Maximum	269.50	177.61	42.42	57.86	269.50
		Minimum	0.16	0.10	0.31	0.06	0.06
	All together	N	20	18	11	30	79
		Mean	16.90	14.16	7.49	7.17	11.27
		Std. Deviation	59.91	41.45	12.19	11.93	36.60
		Median	1.48	1.08	3.78	2.72	1.67
		Maximum	269.50	177.61	42.42	57.86	269.50
		Minimum	0.16	0.10	0.31	0.06	0.06
All Shifts	Grid	N	2	1	-	1	4
		Mean	0.64	2.89	-	1.31	1.37
		Std. Deviation	0.61	-	-	-	1.12
		Median	0.64	2.89	-	1.31	1.19
		Maximum	1.07	2.89	-	1.31	2.89
		Minimum	0.21	2.89	-	1.31	0.21
	Captive & Grid	N	41	39	26	36	142
		Mean	15.06	10.27	5.59	6.59	9.86
		Std. Deviation	45.17	29.58	8.94	10.98	29.54
		Median	1.56	1.17	1.80	2.95	2.00
		Maximum	269.50	177.61	42.42	57.86	269.50
		Minimum	0.03	0.10	0.10	0.04	0.03
	All together	N	43	40	26	37	146
		Mean	14.39	10.09	5.59	6.45	9.63
		Std. Deviation	44.19	29.22	8.94	10.86	29.17
		Median	1.41	1.31	1.80	2.71	1.91
		Maximum	269.50	177.61	42.42	57.86	269.50
		Minimum	0.03	0.10	0.10	0.04	0.03

A7.3 Average weighted cost of production loss per unit of electricity not available in Karnataka (Rs/kWh)

Statistics	HT	LT	Total
N	92	162	255
Mean	22.40	15.46	22.10
Std. Deviation	105.71	35.54	103.67
Median	5.36	4.04	5.36
Maximum	3232.70	466.51	3232.70
Minimum	0.03	0.02	0.02

A.7.3.1 Average weighted cost of production loss per unit of electricity not available in LT industries in Karnataka (Rs/kWh)

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0-20	20-40	40-80	>80	Total
1	Grid	N	13	16	22	6	57
		Mean	15.93	15.38	16.40	1.39	11.47
		Std. Deviation	32.96	55.52	25.79	1.73	32.44
		Median	5.93	1.84	10.59	0.81	1.84
		Maximum	229.84	466.51	174.51	24.11	466.51
		Minimum	2.15	0.35	0.09	0.76	0.09
	Captive & Grid	N	3	9	16	12	40
		Mean	110.32	35.92	14.61	37.58	24.62
		Std. Deviation	54.52	83.72	31.65	65.90	53.36
		Median	135.97	2.14	4.04	27.46	4.04
		Maximum	163.68	293.79	160.66	292.49	293.79
		Minimum	51.93	1.41	1.51	0.22	0.22
	All together	N	16	25	38	18	97
		Mean	29.13	24.42	15.14	22.01	19.28
		Std. Deviation	49.21	70.10	30.03	52.89	46.48
		Median	6.76	2.14	4.04	2.56	4.04
		Maximum	229.84	466.51	174.51	292.49	466.51
		Minimum	2.15	0.35	0.09	0.22	0.09
2	Grid	N	5	4	10	2	21
		Mean	12.86	31.82	36.44	1.00	17.89
		Std. Deviation	9.78	75.99	64.55	0.31	48.97
		Median	7.73	2.00	5.14	1.18	1.18
		Maximum	34.07	285.96	264.93	1.18	285.96
		Minimum	1.28	2.00	0.90	0.49	0.49
	Captive & Grid	N	3	3	11	11	28
		Mean	19.87	25.70	19.32	16.84	18.04
		Std. Deviation	18.27	25.71	22.20	13.85	17.60
		Median	12.76	4.27	6.02	15.97	7.84
		Maximum	57.44	73.15	108.02	41.10	108.02
		Minimum	9.91	4.27	0.43	0.62	0.43
	All together	N	8	7	21	13	49
		Mean	15.40	28.99	27.43	11.45	17.98
		Std. Deviation	13.90	58.49	48.02	13.52	33.98
		Median	9.91	4.27	5.38	4.65	5.14
		Maximum	57.44	285.96	264.93	41.10	285.96
		Minimum	1.28	2.00	0.43	0.49	0.43
3	Grid only	N	-	-	1	3	4
		Mean	-	-	19.61	7.25	8.62
		Std. Deviation	-	-	0.00	4.92	6.04
		Median	-	-	19.61	8.07	8.07
		Maximum	-	-	19.61	14.82	19.61
		Minimum	-	-	19.61	1.76	1.76

A.7.3.1 Contd./-

A.7.3.1 Continued

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0 - 20	20 - 40	40 - 80	> 80	Total
	Captive & Grid	N	-	1	3	8	12
		Mean	-	32.47	27.62	5.07	8.05
		Std. Deviation	-	0.00	12.11	14.18	15.88
		Median	-	32.47	35.14	1.29	1.48
		Maximum	-	32.47	35.14	70.99	70.99
		Minimum	-	32.47	3.48	0.02	0.02
	All together	N	-	1	4	11	16
		Mean	-	32.47	24.42	5.79	8.24
		Std. Deviation	-	0.00	10.17	11.99	13.48
		Median	-	32.47	19.61	1.48	1.76
		Maximum	-	32.47	35.14	70.99	70.99
		Minimum	-	32.47	3.48	0.02	0.02
All Shifts	Grid	N	18	20	33	11	82
		Mean	15.25	19.24	24.95	3.93	12.79
		Std. Deviation	29.44	61.35	46.20	4.57	35.09
		Median	6.76	2.00	5.14	1.18	2.70
		Maximum	229.84	466.51	264.93	24.11	466.51
		Minimum	1.28	0.35	0.09	0.49	0.09
	Captive & Grid	N	6	13	30	31	80
		Mean	65.02	33.17	16.89	14.58	17.10
		Std. Deviation	60.80	65.65	28.53	32.74	35.72
		Median	51.93	8.16	4.04	2.56	4.04
		Maximum	163.68	293.79	160.66	292.49	293.79
		Minimum	9.91	1.41	0.43	0.02	0.02
	All together	N	24	33	63	42	162
		Mean	25.30	26.25	19.82	10.82	15.46
		Std. Deviation	42.87	63.93	36.17	26.96	35.54
		Median	7.14	4.27	5.00	1.76	4.04
		Maximum	229.84	466.51	264.93	292.49	466.51
		Minimum	1.28	0.35	0.09	0.02	0.02

A.7.3.2 Average weighted cost of production loss per unit of electricity not available in HT industries in Karnataka (Rs/kWh)

Shifts	Electricity source	Statistics	Contract demand (kVA)				
			< 200	200 - 400	400 - 600	> 600	Total
1	Grid	N	1	1	-	1	3
		Mean	1.63	25.90	-	0.07	3.64
		Std. Deviation	0.00	0.00	-	0.00	8.46
		Median	1.63	25.90	-	0.07	0.07
		Maximum	1.63	25.90	-	0.07	25.90
		Minimum	1.63	25.90	-	0.07	0.07
	Captive & Grid	N	10	8	2	6	26
		Mean	8.11	12.78	0.67	56.54	42.64
		Std. Deviation	11.26	19.54	1.65	164.30	141.62
		Median	1.67	3.69	0.28	1.53	1.53
		Maximum	60.29	64.58	7.67	582.08	582.08
		Minimum	0.27	0.67	0.28	0.21	0.21
	All together	N	11	9	2	7	29
		Mean	6.21	14.11	0.67	52.03	39.29
		Std. Deviation	9.92	18.94	1.65	158.34	135.87
		Median	1.63	11.68	0.28	1.53	1.53
		Maximum	60.29	64.58	7.67	582.08	582.08
		Minimum	0.27	0.67	0.28	0.07	0.07
2	Grid	N	1	2	-	2	5
		Mean	3.70	3.80	-	1.96	2.61
		Std. Deviation	0.00	1.25	-	1.14	1.34
		Median	3.70	2.61	-	1.18	2.61
		Maximum	3.70	5.12	-	3.62	5.12
		Minimum	3.70	2.61	-	1.18	1.18
	Captive & Grid	N	3	9	2	3	17
		Mean	53.47	154.51	6.07	16.62	34.26
		Std. Deviation	30.52	619.68	1.07	3.39	229.43
		Median	48.09	22.95	5.36	19.41	16.19
		Maximum	81.64	3232.70	7.70	19.41	3232.70
		Minimum	7.92	0.03	5.36	11.51	0.03
	All together	N	4	11	2	5	22
		Mean	20.77	127.98	6.07	14.50	29.13
		Std. Deviation	29.62	565.43	1.07	6.05	210.33
		Median	3.70	5.12	5.36	16.19	16.19
		Maximum	81.64	3232.70	7.70	19.41	3232.70
		Minimum	3.70	0.03	5.36	1.18	0.03

A.7.3.2 Contd./-

A.7.3.2 Continued

Shifts	Electricity source	Statistics	Contract demand (kVA)				
			< 200	200 - 400	400 - 600	> 600	Total
3	Grid	N	-	-	-	-	-
		Mean	-	-	-	-	-
		Std. Deviation	-	-	-	-	-
		Median	-	-	-	-	-
		Maximum	-	-	-	-	-
		Minimum	-	-	-	-	-
	Captive & Grid	N	10	8	5	19	42
		Mean	4.30	20.06	92.96	13.55	17.18
		Std. Deviation	8.21	67.88	165.34	21.18	46.21
		Median	1.25	0.74	22.25	4.67	4.67
		Maximum	42.55	296.55	506.15	92.11	506.15
		Minimum	0.54	0.10	7.86	0.05	0.05
	All together	N	10	8	5	19	42
		Mean	4.30	20.06	92.96	13.55	17.18
		Std. Deviation	8.21	67.88	165.34	21.18	46.21
		Median	1.25	0.74	22.25	4.67	4.67
		Maximum	42.55	296.55	506.15	92.11	506.15
		Minimum	0.54	0.10	7.86	0.05	0.05
All shifts	Grid	N	2	3	-	3	8
		Mean	3.02	10.72	-	1.29	2.96
		Std. Deviation	0.97	10.30	-	1.29	5.10
		Median	3.70	5.12	-	1.18	1.18
		Maximum	3.70	25.90	-	3.62	25.90
		Minimum	1.63	2.61	-	0.07	0.07
	Captive & Grid	N	23	25	9	28	85
		Mean	9.40	55.27	47.24	19.31	23.16
		Std. Deviation	18.59	334.03	124.24	62.70	107.71
		Median	2.13	0.84	7.70	10.63	7.00
		Maximum	81.64	3232.70	506.15	582.08	3232.70
		Minimum	0.27	0.03	0.28	0.05	0.03
	All together	N	25	28	9	31	93
		Mean	8.12	51.76	47.24	18.77	22.40
		Std. Deviation	16.81	320.86	124.24	61.84	105.71
		Median	3.12	0.91	7.70	7.00	5.36
		Maximum	81.64	3232.70	506.15	582.08	3232.70
		Minimum	0.27	0.03	0.28	0.05	0.03

A7.4 Average unweighted cost of production loss per unit of electricity not available in Karnataka (Rs/kWh)

Statistics	HT	LT	Total
N	92	162	255
Mean	65.22	37.15	47.30
Std. Deviation	342.82	64.87	212.36
Median	5.36	12.85	9.80
Maximum	3232.70	466.51	3232.70
Minimum	0.03	0.02	0.02

A.7.4.1 Average unweighted cost of production loss per unit of electricity not available in LT industries in Karnataka (Rs/kWh)

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0-20	20-40	40-80	>80	Total
1	Grid	N	13	16	22	6	57
		Mean	31.40	51.50	39.05	5.43	37.26
		Std. Deviation	62.52	113.76	49.31	9.30	73.48
		Median	6.76	12.23	15.82	0.95	10.59
		Maximum	229.84	466.51	174.51	24.11	466.51
		Minimum	2.15	0.35	0.09	0.76	0.09
	Captive & Grid	N	3	9	16	12	40
		Mean	117.19	54.17	37.24	43.45	48.91
		Std. Deviation	58.19	95.96	46.28	80.03	71.57
		Median	135.97	9.94	13.79	27.40	23.44
		Maximum	163.68	293.79	160.66	292.49	293.79
		Minimum	51.93	1.41	1.51	0.22	0.22
	All together	N	16	25	38	18	97
		Mean	47.49	52.46	38.29	30.78	42.06
		Std. Deviation	69.10	105.64	47.42	67.15	72.55
		Median	6.99	10.22	15.82	10.83	12.94
		Maximum	229.84	466.51	174.51	292.49	466.51
		Minimum	2.15	0.35	0.09	0.22	0.09
2	Grid	N	5	4	10	2	21
		Mean	18.52	94.62	52.55	0.83	47.54
		Std. Deviation	14.59	132.38	87.16	0.49	83.51
		Median	17.09	45.26	11.03	0.83	9.80
		Maximum	34.07	285.96	264.93	1.18	285.96
		Minimum	1.28	2.00	0.90	0.49	0.49
	Captive & Grid	N	3	3	11	11	28
		Mean	26.70	39.44	30.67	19.34	26.73
		Std. Deviation	26.66	34.47	33.82	14.69	26.28
		Median	12.76	40.91	18.80	19.43	19.12
		Maximum	57.44	73.15	108.02	41.10	108.02
		Minimum	9.91	4.27	0.43	0.62	0.43

A.7.4.1 Contd./-

A.7.4.1 Continued

Shifts	Electricity source	Statistics	Sanctioned load (hp)				
			0-20	20-40	40-80	> 80	Total
	All together	N	8	7	21	13	49
		Mean	21.59	70.97	41.09	16.49	35.65
		Std. Deviation	18.51	100.14	64.15	15.10	58.33
		Median	14.92	40.91	15.98	15.97	15.98
		Maximum	57.44	285.96	264.93	41.10	285.96
		Minimum	1.28	2.00	0.43	0.49	0.43
3	Grid	N	-	-	1	3	4
		Mean	-	-	19.61	8.22	11.07
		Std. Deviation	-	-	-	6.53	7.80
		Median	-	-	19.61	8.07	11.45
		Maximum	-	-	19.61	14.82	19.61
		Minimum	-	-	19.61	1.76	1.76
	Captive & Grid	N	-	1	3	8	12
		Mean	-	32.47	21.85	14.18	17.62
		Std. Deviation	-		16.43	24.48	21.54
		Median	-	32.47	26.94	3.27	6.33
		Maximum	-	32.47	35.14	70.99	70.99
		Minimum	-	32.47	3.48	0.02	0.02
	All together	N	-	1	4	11	16
		Mean	-	32.47	21.29	12.56	15.99
		Std. Deviation	-		13.46	20.88	19.00
		Median	-	32.47	23.28	5.07	7.82
		Maximum	-	32.47	35.14	70.99	70.99
		Minimum	-	32.47	3.48	0.02	0.02
All shifts	Grid	N	18	20	33	11	82
		Mean	27.82	60.12	42.55	5.35	38.61
		Std. Deviation	53.33	115.31	61.55	7.64	74.27
		Median	6.99	12.23	15.98	1.18	10.41
		Maximum	229.84	466.51	264.93	24.11	466.51
		Minimum	1.28	0.35	0.09	0.49	0.09
	Captive & Grid	N	6	13	30	31	80
		Mean	71.95	49.10	33.30	27.34	36.46
		Std. Deviation	64.00	80.02	39.31	52.28	54.73
		Median	54.68	19.54	18.34	16.70	19.12
		Maximum	163.68	293.79	160.66	292.49	293.79
		Minimum	9.91	1.41	0.43	0.02	0.02
	All together	N	24	33	63	42	162
		Mean	38.85	55.78	38.14	21.58	37.55
		Std. Deviation	58.08	101.62	51.96	45.94	65.16
		Median	11.33	14.23	16.90	7.71	13.59
		Maximum	229.84	466.51	264.93	292.49	466.51
		Minimum	1.28	0.35	0.09	0.02	0.02

A.7.4.2 Average unweighted cost of production loss per unit of electricity not available in HT industries in Karnataka (Rs/kWh)

Shifts	Electricity source	Statistics	Contract demand (kVA)				
			<200	200 - 400	400 - 600	>600	Total
1	Grid only	N	1	1	-	1	3
		Mean	1.63	25.90	-	0.07	9.20
		Std. Deviation	-.	-	-	-	14.48
		Median	1.63	25.90	-	0.07	1.63
		Maximum	1.63	25.90	-	0.07	25.90
		Minimum	1.63	25.90	-	0.07	0.07
	Captive & Grid	N	10	8	2	6	26
		Mean	11.44	16.50	3.98	107.72	34.64
		Std. Deviation	19.20	21.61	5.23	232.90	113.09
		Median	3.40	9.34	3.98	11.01	3.77
		Maximum	60.29	64.58	7.67	582.08	582.08
		Minimum	0.27	0.67	0.28	0.21	0.21
	All together	N	11	9	2	7	29
		Mean	10.55	17.54	3.98	92.34	32.01
		Std. Deviation	18.45	20.46	5.23	216.46	107.22
		Median	3.07	11.68	3.98	3.03	3.73
		Maximum	60.29	64.58	7.67	582.08	582.08
		Minimum	0.27	0.67	0.28	0.07	0.07
2	Grid	N	1	2	-	2	5
		Mean	3.70	3.87	-	2.40	3.25
		Std. Deviation	.-	1.78	-	1.73	1.46
		Median	3.70	3.87	-	2.40	3.62
		Maximum	3.70	5.12	-	3.62	5.12
		Minimum	3.70	2.61	-	1.18	1.18
	Captive & Grid	N	3	9	2	3	17
		Mean	45.88	391.42	6.53	15.70	218.86
		Std. Deviation	36.91	1066.33	1.65	3.97	777.46
		Median	48.09	22.95	6.53	16.19	16.19
		Maximum	81.64	3232.70	7.70	19.41	3232.70
		Minimum	7.92	0.03	5.36	11.51	0.03
	All together	N	4	11	2	5	22
		Mean	35.34	320.96	6.53	10.38	169.86
		Std. Deviation	36.78	966.55	1.65	7.85	684.89
		Median	28.01	5.12	6.53	11.51	7.81
		Maximum	81.64	3232.70	7.70	19.41	3232.70
		Minimum	3.70	0.03	5.36	1.18	0.03
3	Grid	N	-	-	-	-	-
		Mean	-	-	-	-	-
		Std. Deviation	-	-	-	-	-
		Median	-	-	-	-	-
		Maximum	-	-	-	-	-
		Minimum	-	-	-	-	-

A.7.4.2 Contd./-

A.7.4.2 Continued

Shifts	Electricity source	Statistics	Contract demand (kVA)				
			< 200	200 - 400	400 - 600	> 600	Total
	Captive & Grid	N	10	8	5	19	42
		Mean	8.00	42.42	120.17	19.99	33.33
		Std. Deviation	13.51	102.97	216.33	26.82	88.92
		Median	2.63	3.52	22.25	7.00	5.48
		Maximum	42.55	296.55	506.15	92.11	506.15
		Minimum	0.54	0.10	7.86	0.05	0.05
	All together	N	10	8	5	19	42
		Mean	8.00	42.42	120.17	19.99	33.33
		Std. Deviation	13.51	102.97	216.33	26.82	88.92
		Median	2.63	3.52	22.25	7.00	5.48
		Maximum	42.55	296.55	506.15	92.11	506.15
		Minimum	0.54	0.10	7.86	0.05	0.05
All Shifts	Grid	N	2	3	-	3	8
		Mean	2.67	11.21	-	1.63	5.48
		Std. Deviation	1.47	12.78	-	1.82	8.40
		Median	2.67	5.12	-	1.18	3.12
		Maximum	3.70	25.90	-	3.62	25.90
		Minimum	1.63	2.61	-	0.07	0.07
	Captive & Grid	N	23	25	9	28	85
		Mean	14.44	159.77	69.09	38.33	70.84
		Std. Deviation	22.52	643.28	164.53	109.04	358.25
		Median	3.23	7.00	7.86	10.66	7.00
		Maximum	81.64	3232.70	506.15	582.08	3232.70
		Minimum	0.27	0.03	0.28	0.05	0.03
	All together	N	25	28	9	31	93
		Mean	13.50	143.85	69.09	34.78	65.22
		Std. Deviation	21.81	608.30	164.53	104.03	342.82
		Median	3.23	6.65	7.86	7.00	5.36
		Maximum	81.64	3232.70	506.15	582.08	3232.70
		Minimum	0.27	0.03	0.28	0.05	0.03

Method 2

A7.5 Average weighted[2] cost of captive generation in Haryana (Rs/kWh)

Industry	Statistics	Estimated for given lifetime of generators	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
HT	N	263	263	263
	Mean	3.7	2.9	1.8
	Std. Deviation	1.2	0.9	0.8
	Median	3.6	3.1	1.8
	Maximum	17.8	6.4	5.9
	Minimum	1.7	0.7	0.3
LT	N	182	182	182
	Mean	4.1	3.3	3.0
	Std. Deviation	1.4	0.8	0.9
	Median	3.7	3.2	3.1
	Maximum	11.6	5.4	7.0
	Minimum	1.9	1.5	1.4
All together	N	445	445	445
	Mean	3.7	2.9	1.8
	Std. Deviation	1.2	0.9	0.8
	Median	3.6	3.1	1.8
	Maximum	17.8	6.4	7.0
	Minimum	1.7	0.7	0.3

[2] Weighted by total kWh generated by captive generators in an industry

A7.5.1 Average weighted cost of captive generation in LT industries classified by sanctioned load in Haryana (Rs/kWh)

Sanctioned load (hp)	Statistics	Estimated for given lifetime of generators	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
0-20	N	14	14	14
	Mean	5.2	3.9	3.9
	Std. Deviation	1.0	0.9	1.0
	Median	4.9	4.0	3.9
	Maximum	10.6	5.3	5.3
	Minimum	3.4	2.2	1.8
20-40	N	89	89	89
	Mean	4.5	3.6	3.4
	Std. Deviation	1.4	0.8	0.9
	Median	4.2	3.5	3.3
	Maximum	11.6	5.4	7.0
	Minimum	1.9	1.5	1.5
40-80	N	33	33	33
	Mean	4.3	3.7	3.2
	Std. Deviation	1.2	0.7	0.7
	Median	3.5	3.9	3.4
	Maximum	8.5	5.1	5.1
	Minimum	3.1	2.3	1.4
>80	N	46	46	46
	Mean	3.7	3.0	2.8
	Std. Deviation	1.3	0.8	0.9
	Median	3.4	2.9	2.4
	Maximum	9.8	5.0	6.0
	Minimum	2.1	2.0	1.4
All LT	N	182	182	182
	Mean	4.1	3.3	3.0
	Std. Deviation	1.4	0.8	0.9
	Median	3.7	3.2	3.1
	Maximum	11.6	5.4	7.0
	Minimum	1.9	1.5	1.4

A7.5.2 Average weighted cost of captive generation in HT industries classified by contract demand in Haryana (Rs/kWh)

Contract demand (kVA)	Statistics	Estimated for given lifetime of generators	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
< 200	N	78	78	78
	Mean	3.3	3.0	2.0
	Std. Deviation	1.0	0.6	0.8
	Median	3.2	2.9	2.0
	Maximum	8.6	5.0	4.9
	Minimum	1.8	1.8	0.8
200 - 400	N	77	77	77
	Mean	4.3	3.5	2.1
	Std. Deviation	2.5	0.8	1.0
	Median	3.7	3.6	2.0
	Maximum	17.8	6.4	5.6
	Minimum	1.9	2.2	0.6
400 - 600	N	47	47	47
	Mean	3.5	3.3	1.9
	Std. Deviation	1.4	1.2	0.9
	Median	3.5	3.1	1.8
	Maximum	8.4	6.0	5.9
	Minimum	1.7	1.6	0.6
> 600	N	61	61	61
	Mean	3.7	2.8	1.7
	Std. Deviation	1.1	0.8	0.8
	Median	3.6	3.1	1.8
	Maximum	8.8	5.1	5.5
	Minimum	1.7	0.7	0.3
All HT	N	263	263	263
	Mean	3.7	2.9	1.8
	Std. Deviation	1.2	0.9	0.8
	Median	3.6	3.1	1.8
	Maximum	17.8	6.4	5.9
	Minimum	1.7	0.7	0.3

A7.6 Average unweighted cost of captive generation in Haryana (Rs/kWh)

Industry	Statistics	Estimated for given lifetime of generators	Estimated for fixed lifetime of generators	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
HT	N	263	263	263	263
	Mean	4.1	4.2	3.3	2.3
	Std. Deviation	1.7	1.8	0.9	1.2
	Median	3.8	3.8	3.3	2.2
	Maximum	17.8	20.2	6.4	5.9
	Minimum	1.7	1.7	0.7	0.3
LT	N	182	182	182	182
	Mean	5.0	5.1	3.5	3.5
	Std. Deviation	1.7	1.9	0.8	1.0
	Median	4.7	4.7	3.5	3.4
	Maximum	11.6	11.6	5.4	7.0
	Minimum	1.9	2.0	1.5	1.4
All together	N	445	445	445	445
	Mean	4.5	4.5	3.4	2.8
	Std. Deviation	1.8	1.9	0.9	1.2
	Median	4.2	4.3	3.4	2.8
	Maximum	17.8	20.2	6.4	7.0
	Minimum	1.7	1.7	0.7	0.3

A7.6.1 Average unweighted cost of captive generation in LT industries classified by sanctioned load in Haryana (Rs/kWh)

Sanctioned load (hp)	Statistics	Estimated for given lifetime of generators	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
0-20	N	14	14	14
	Mean	5.9	3.7	3.6
	Std. Deviation	1.9	1.0	1.1
	Median	5.4	3.9	3.8
	Maximum	10.6	5.3	5.3
	Minimum	3.4	2.2	1.8
20-40	N	89	89	89
	Mean	5.1	3.7	3.6
	Std. Deviation	1.7	0.8	1.0
	Median	4.8	3.6	3.5
	Maximum	11.6	5.4	7.0
	Minimum	1.9	1.5	1.5
40-80	N	33	33	33
	Mean	4.9	3.5	3.4
	Std. Deviation	1.4	0.7	0.8
	Median	4.7	3.5	3.4
	Maximum	8.5	5.1	5.1
	Minimum	3.1	2.3	1.4
>80	N	46	46	46
	Mean	4.6	3.3	3.2
	Std. Deviation	1.8	0.8	1.0
	Median	4.4	3.2	3.2
	Maximum	9.8	5.0	6.0
	Minimum	2.1	2.0	1.4
All LT	N	182	182	182
	Mean	5.0	3.5	3.5
	Std. Deviation	1.7	0.8	1.0
	Median	4.7	3.5	3.4
	Maximum	11.6	5.4	7.0
	Minimum	1.9	1.5	1.4

A7.6.2 Average unweighted cost of captive generation in HT industries classified by contract demand in Haryana (Rs/kWh)

Contract demand (kVA)	Statistics	Estimated for given lifetime of generators	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
< 200	N	78	78	78
	Mean	4.0	3.2	2.5
	Std. Deviation	1.3	0.7	1.0
	Median	3.7	3.1	2.5
	Maximum	8.6	5.0	4.9
	Minimum	1.8	1.8	0.8
200 - 400	N	77	77	77
	Mean	4.4	3.5	2.6
	Std. Deviation	2.2	0.8	1.2
	Median	4.0	3.5	2.7
	Maximum	17.8	6.4	5.6
	Minimum	1.9	2.2	0.6
400 - 600	N	47	47	47
	Mean	4.2	3.4	2.3
	Std. Deviation	1.6	1.0	1.2
	Median	4.0	3.4	2.2
	Maximum	8.4	6.0	5.9
	Minimum	1.7	1.6	0.6
> 600	N	61	61	61
	Mean	3.8	3.2	1.7
	Std. Deviation	1.4	0.8	1.1
	Median	3.6	3.1	1.4
	Maximum	8.8	5.1	5.5
	Minimum	1.7	0.7	0.3
All HT	N	263	263	263
	Mean	4.1	3.3	2.3
	Std. Deviation	1.7	0.9	1.2
	Median	3.8	3.3	2.2
	Maximum	17.8	6.4	5.9
	Minimum	1.7	0.7	0.3

A7.7 Average weighted cost of captive generation in Karnataka (Rs/kWh)

Industry	Statistics	Estimated for given lifetime	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
HT	N	147	147	147
	Mean	2.61	2.82	0.72
	Std. Deviation	0.98	0.88	0.75
	Median	2.11	2.25	0.25
	Maximum	32.43	7.31	8.62
	Minimum	1.54	1.95	0.25
LT	N	135	135	135
	Mean	4.05	3.48	2.38
	Std. Deviation	2.18	1.13	1.28
	Median	3.85	3.80	2.19
	Maximum	89.70	25.00	33.33
	Minimum	1.90	1.76	0.88
All together	N	282	282	282
	Mean	2.63	2.83	0.74
	Std. Deviation	1.02	0.89	0.78
	Median	2.11	2.25	0.51
	Maximum	89.70	25.00	33.33
	Minimum	1.54	1.76	0.25

A7.7.1 Average weighted cost of captive generation in LT industries classified by sanctioned load in Karnataka (Rs/kWh)

Sanctioned load (hp)	Statistics	Estimated for given lifetime	Reported by respondent	Operating costs (fuel + maint) without the capital cost
0-20	N	9	9	9
	Mean	3.66	4.83	1.81
	Std. Deviation	1.63	0.72	1.24
	Median	3.27	5.00	1.42
	Maximum	57.45	25.00	33.33
	Minimum	3.27	3.00	1.42
20-40	N	22	22	22
	Mean	4.9	3.4	2.9
	Std. Deviation	4.5	0.8	1.3
	Median	4.9	3.2	3.2
	Maximum	89.7	6.0	7.0
	Minimum	2.7	2.7	1.6
40-80	N	47	47	47
	Mean	5.6	4.0	3.4
	Std. Deviation	2.4	0.7	1.0
	Median	4.8	4.0	3.5

A7.7.1 Contd./-

A7.7.1 Continued

Sanctioned load (hp)	Statistics	Estimated for given lifetime	Reported by respondent	Operating costs (fuel + maint) without the capital cost
	Maximum	27.5	6.5	6.4
	Minimum	3.2	2.0	1.6
>80	N	57	57	57
	Mean	3.8	3.2	2.2
	Std. Deviation	1.8	1.1	1.2
	Median	3.6	3.7	1.9
	Maximum	29.2	7.0	6.5
	Minimum	1.9	1.8	0.9
All LT	N	135	135	135
	Mean	4.1	3.5	2.4
	Std. Deviation	2.2	1.1	1.3
	Median	3.8	3.8	2.2
	Maximum	89.7	25.0	33.3
	Minimum	1.9	1.8	0.9

A7.7.2 Average weighted cost of captive generation in HT industries classified by contract demand in Karnataka (Rs/kWh)

Contract demand (kVA)	Statistics	Estimated for given lifetime	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
<200	N	33	33	33
	Mean	4.9	3.7	3.3
	Std. Deviation	2.6	0.7	1.2
	Median	3.9	3.5	3.2
	Maximum	32.4	7.0	8.6
	Minimum	3.1	3.0	1.5
200-400	N	54	54	54
	Mean	4.3	4.1	2.5
	Std. Deviation	1.6	0.6	1.0
	Median	4.0	4.0	2.2
	Maximum	28.2	6.7	7.0
	Minimum	2.4	2.3	1.2
400-600	N	13	13	13
	Mean	4.6	3.8	2.1
	Std. Deviation	1.2	0.4	1.1
	Median	4.2	3.8	1.6
	Maximum	10.0	5.7	5.7
	Minimum	3.3	3.3	1.0
>600	N	47	47	47
	Mean	2.5	2.8	0.6
	Std. Deviation	0.8	0.9	0.6

A7.7.2 Continued

A7.7.2 Continued

Contract demand (kVA)	Statistics	Estimated for given lifetime	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
	Median	2.1	2.3	0.2
	Maximum	21.3	7.3	4.7
	Minimum	1.5	2.0	0.2
All HT	N	147	147	147
	Mean	2.6	2.8	0.7
	Std. Deviation	1.0	0.9	0.8
	Median	2.1	2.3	0.2
	Maximum	32.4	7.3	8.6
	Minimum	1.5	2.0	0.2

A7.8 Average unweighted cost of captive generation in Karnataka (Rs/kWh)

Industry	Statistics	Estimated for given lifetime	Reported by the respondent	Operating costs (fuel + maint) without the capital cost
HT	N	147	147	147
	Mean	6.1	3.9	2.8
	Std. Deviation	4.2	0.9	1.5
	Median	4.9	3.8	2.7
	Maximum	32.4	7.3	8.6
	Minimum	1.5	2.0	0.2
LT	N	135	135	135
	Mean	8.0	4.2	3.9
	Std. Deviation	9.2	2.0	2.8
	Median	5.9	4.0	3.8
	Maximum	89.7	25.0	33.3
	Minimum	1.9	1.8	0.9
All together	N	282	282	282
	Mean	7.0	4.1	3.4
	Std. Deviation	7.1	1.5	2.3
	Median	5.5	4.0	3.4
	Maximum	89.7	25.0	33.3
	Minimum	1.5	1.8	0.2

A7.8.1 Average unweighted cost of captive generation in LT industries classified by sanctioned load in Karnataka (Rs/kWh)

Sanctioned load (hp)	Statistics	Estimated for given lifetime	Reported by respondent	Operating costs (fuel + maint) without the capital cost
0-20	N	9	9	9
	Mean	12.8	6.9	7.6
	Std. Deviation	17.1	6.9	9.8
	Median	5.9	4.5	4.4
	Maximum	57.5	25.0	33.3
	Minimum	3.3	3.0	1.4
20-40	N	22	22	22
	Mean	10.3	4.0	3.9
	Std. Deviation	17.9	0.9	1.2
	Median	5.9	4.0	3.8
	Maximum	89.7	6.0	7.0
	Minimum	2.7	2.7	1.6
40-80	N	47	47	47
	Mean	7.7	4.1	3.8
	Std. Deviation	4.4	0.9	1.0
	Median	7.2	4.0	3.8
	Maximum	27.5	6.5	6.4
	Minimum	3.2	2.0	1.6
>80	N	57	57	57
	Mean	6.6	4.0	3.5
	Std. Deviation	4.1	0.9	1.1
	Median	5.5	4.0	3.6
	Maximum	29.2	7.0	6.5
	Minimum	1.9	1.8	0.9
All LT	N	135	135	135
	Mean	8.0	4.2	3.9
	Std. Deviation	9.2	2.0	2.8
	Median	5.9	4.0	3.8
	Maximum	89.7	25.0	33.3
	Minimum	1.9	1.8	0.9

A7.8.2 Average unweighted cost of captive generation in HT industries classified by contract demand in Karnataka (Rs/kWh)

Contract demand (kVA)	Statistics	Estimated for given lifetime	Reported by the respondent	Operating costs (fuel + maint) Without the capital cost
<200	N	33	33	33
	Mean	7.8	4.1	3.9
	Std. Deviation	5.4	0.8	1.3
	Median	6.5	4.0	3.8
	Maximum	32.4	7.0	8.6
	Minimum	3.1	3.0	1.5
200 - 400	N	54	54	54
	Mean	6.4	4.0	3.2
	Std. Deviation	4.1	0.8	1.2
	Median	5.2	4.0	3.3
	Maximum	28.2	6.7	7.0
	Minimum	2.4	2.3	1.2
400 - 600	N	13	13	13
	Mean	5.8	4.2	2.7
	Std. Deviation	2.1	0.8	1.3
	Median	5.1	4.0	2.5
	Maximum	10.0	5.7	5.7
	Minimum	3.3	3.3	1.0
>600	N	47	47	47
	Mean	4.6	3.7	1.8
	Std. Deviation	3.1	1.0	1.2
	Median	3.7	3.5	1.3
	Maximum	21.3	7.3	4.7
	Minimum	1.5	2.0	0.2
All HT	N	147	147	147
	Mean	6.1	3.9	2.8
	Std. Deviation	4.2	0.9	1.5
	Median	4.9	3.8	2.7
	Maximum	32.4	7.3	8.6
	Minimum	1.5	2.0	0.2

ANNEX 8

CUE ESTIMATES IN AGRICULTURE

Method 1

A8.1 Average weighted[1] net cost of production loss per unit of electricity not available in Haryana (Rs/kWh)

Statistics	Land holding category					
	M (Marginal)	S (Small)	SM (Semi-medium)	ME (Medium)	L (Large)	Total
N	42	89	58	30	13	232
Mean	1.90	2.47	1.92	1.04	1.84	1.83
Std. Deviation	4.47	3.94	3.22	1.35	1.63	3.21
5% trimmed mean	1.06	1.92	1.40	0.84	1.70	1.34
Median	0.53	1.20	0.73	0.63	1.32	0.77
Maximum	29.44	33.61	22.67	7.35	5.96	33.61
Minimum	0.05	0.08	0.03	0.05	0.16	0.03

A8.1.1 Average weighted net cost of production loss per unit of electricity not available by zones and districts in Haryana (Rs/kWh)

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
Western plain, Kutch and part of Kathiawar peninsula	Mahendragarh	N	4	16	14	13	3	50
		Mean	0.41	1.49	1.59	1.09	1.57	1.22
		Std. Deviation	1.02	1.65	3.07	1.85	2.08	2.14
		Median	0.18	0.76	0.29	0.25	0.65	0.25
		Maximum	6.17	6.77	12.05	7.35	5.42	12.05
		Minimum	0.18	0.08	0.05	0.05	0.17	0.05
	Sirsa	N	2	4	6	4	5	21
		Mean	5.90	2.53	5.02	0.78	2.26	2.77
		Std. Deviation	0.32	2.36	5.36	0.24	2.11	3.31
		Median	5.77	0.92	1.37	0.63	1.32	1.32
		Maximum	6.65	8.40	13.99	1.35	5.96	13.99
		Minimum	5.77	0.92	0.60	0.62	0.25	0.25
	Total	N	6	20	20	17	8	71
		Mean	0.78	1.75	2.41	1.06	2.04	1.62
		Std. Deviation	1.70	1.90	4.02	1.76	2.12	2.58
		Median	0.18	0.92	0.30	0.25	0.97	0.60
		Maximum	6.65	8.40	13.99	7.35	5.96	13.99
		Minimum	0.18	0.08	0.05	0.05	0.17	0.05

A8.1.1 Contd./-

[1] Weighted by energy consumption (in kWh) by the electric pumpsets annually.

A8.1.1 Continued

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
Northern plain and Central high lands including Aravalis	Faridabad	N	-	-	1	1	-	2
		Mean	-	-	0.67	0.84	-	0.73
		Std. Deviation	-	-	-	-	-	0.08
		Median	-	-	0.67	0.84	-	0.67
		Maximum	-	-	0.67	0.84	-	0.84
		Minimum	-	-	0.67	0.84	-	0.67
	Kaithal	N	13	18	13	5	3	52
		Mean	0.82	1.83	1.47	1.02	1.04	1.26
		Std. Deviation	1.11	2.05	1.64	0.52	0.36	1.43
		Median	0.64	0.97	0.93	1.44	1.15	0.93
		Maximum	4.36	8.03	5.16	1.91	1.24	8.03
		Minimum	0.05	0.13	0.03	0.37	0.16	0.03
	Kurukshetra	N	11	15	11	1	1	39
		Mean	3.28	3.75	2.68	4.07	1.90	3.21
		Std. Deviation	4.78	7.06	4.79	-	-	5.65
		Median	1.41	1.46	0.78	4.07	1.90	1.65
		Maximum	13.58	33.61	22.67	4.07	1.90	33.61
		Minimum	0.13	0.43	0.35	4.07	1.90	0.13
	Panipat	N	8	23	3	3	-	37
		Mean	5.79	2.29	1.66	1.19	-	2.63
		Std. Deviation	9.53	2.27	0.77	0.67	-	4.36
		Median	0.90	1.35	1.62	1.45	-	1.45
		Maximum	29.44	9.78	2.32	1.85	-	29.44
		Minimum	0.53	0.19	0.48	0.33	-	0.19
	Rewari	N	-	4	4	-	-	8
		Mean	-	9.77	3.25	-	-	5.59
		Std. Deviation	-	7.40	3.06	-	-	5.96
		Median	-	6.71	1.15	-	-	6.71
		Maximum	-	31.33	7.88	-	-	31.33
		Minimum	-	1.75	0.99	-	-	0.99
	Sonipat	N	1	2	1	1	-	5
		Mean	19.49	3.82	0.27	0.44	-	2.95
		Std. Deviation	-	0.50	-	-	-	5.76
		Median	19.49	4.00	0.27	0.44	-	0.44
		Maximum	19.49	4.00	0.27	0.44	-	19.49
		Minimum	19.49	2.41	0.27	0.44	-	0.27
	Total	N	33	62	33	11	4	143
		Mean	2.39	2.75	1.83	1.08	1.27	2.04
		Std. Deviation	5.15	4.60	3.06	0.83	0.49	3.79
		Median	0.76	1.19	0.78	0.66	1.24	0.94
		Maximum	29.44	33.61	22.67	4.07	1.90	33.61
		Minimum	0.05	0.13	0.03	0.33	0.16	0.03
Northern plain, hot subhumid (dry) region	Kurukshetra	N	3	2	2	2	1	10
		Mean	0.59	1.79	0.56	0.67	1.91	1.11
		Std. Deviation	0.20	1.09	0.25	0.04	-	0.73
		Median	0.65	0.91	0.77	0.63	1.91	0.77
		Maximum	0.71	3.14	0.77	0.72	1.91	3.14
		Minimum	0.15	0.91	0.25	0.63	1.91	0.15

A8.1.1 Contd./-

A8.1.1 Continued

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
	Yamuna Nagar	N	-	5	3	-	-	8
		Mean	-	2.36	2.26	-	-	2.31
		Std. Deviation	-	0.96	0.60	-	-	0.80
		Median	-	2.24	2.10	-	-	2.24
		Maximum	-	3.54	3.01	-	-	3.54
		Minimum	-	1.20	1.71	-	-	1.20
	Total	N	3	7	5	2	1	18
		Mean	0.59	2.13	1.23	0.67	1.91	1.41
		Std. Deviation	0.20	1.05	0.93	0.04	-	0.91
		Median	0.65	2.24	0.77	0.63	1.91	0.91
		Maximum	0.71	3.54	3.01	0.72	1.91	3.54
		Minimum	0.15	0.91	0.25	0.63	1.91	0.15
Total	Total	N	42	89	58	30	13	232
		Mean	1.90	2.47	1.92	1.04	1.84	1.83
		Std. Deviation	4.47	3.94	3.22	1.35	1.63	3.21
		Median	0.53	1.20	0.73	0.63	1.32	0.77
		Maximum	29.44	33.61	22.67	7.35	5.96	33.61
		Minimum	0.05	0.08	0.03	0.05	0.16	0.03

A8.2 Average unweighted cost of production loss per unit of electricity not available in Haryana (Rs/kWh)

Statistics	Land holding category					
	M (Medium)	S (Small)	SM (Semi-medium)	ME (Medium)	L (Large)	Total
N	42	89	58	30	13	232
Mean	3.16	3.34	2.67	1.52	1.79	2.82
Standard Deviation	5.71	5.12	4.03	1.54	1.86	4.54
5% trimmed mean	2.17	2.56	2.06	1.34	1.65	2.10
Median	0.94	1.73	0.96	1.13	1.24	1.23
Maximum	29.44	33.61	22.67	7.35	5.96	33.61
Minimum	0.05	0.08	0.03	0.05	0.16	0.03

A8.2.1 Average unweighted cost of production loss per unit of electricity not available by agro-ecological zones and districts in Haryana (Rs/kWh)

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
Western plain, Kutch and part of Kathiawar peninsula	Mahendragarh	N	4	16	14	13	3	50
		Mean	1.90	1.67	2.88	1.99	2.08	2.13
		Std. Deviation	2.87	1.72	3.90	2.05	2.90	2.66
		Median	0.63	1.02	0.73	1.44	0.65	0.88
		Maximum	6.17	6.77	12.05	7.35	5.42	12.05
		Minimum	0.18	0.08	0.05	0.05	0.17	0.05

A8.2.1 Contd./-

A8.2.1 Continued

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
	Sirsa	N	2	4	6	4	5	21
		Mean	6.21	4.04	4.79	0.88	2.13	3.41
		Std. Deviation	0.63	3.17	5.22	0.34	2.25	3.53
		Median	6.21	3.41	3.18	0.77	1.32	1.37
		Maximum	6.65	8.40	13.99	1.35	5.96	13.99
		Minimum	5.77	0.92	0.60	0.62	0.25	0.25
	Total	N	6	20	20	17	8	71
		Mean	3.34	2.14	3.45	1.73	2.11	2.51
		Std. Deviation	3.16	2.21	4.29	1.85	2.30	2.98
		Median	3.39	1.49	0.88	1.35	1.14	1.28
		Maximum	6.65	8.40	13.99	7.35	5.96	13.99
		Minimum	0.18	0.08	0.05	0.05	0.17	0.05
Northern plain and Central high lands including Aravalis	Faridabad	N	-	-	1	1	-	2
		Mean	-	-	0.67	0.84	-	0.76
		Std. Deviation	-	-			-	0.12
		Median	-	-	0.67	0.84	-	0.76
		Maximum	-	-	0.67	0.84	-	0.84
		Minimum	-	-	0.67	0.84	-	0.67
	Kaithal	N	13	18	13	5	3	52
		Mean	1.28	2.33	1.26	1.18	0.85	1.61
		Std. Deviation	1.24	2.28	1.43	0.64	0.60	1.71
		Median	0.94	1.21	0.93	1.44	1.15	0.96
		Maximum	4.36	8.03	5.16	1.91	1.24	8.03
		Minimum	0.05	0.13	0.03	0.37	0.16	0.03
	Kurukshetra	N	11	15	11	1	1	39
		Mean	2.48	5.01	3.55	4.07	1.90	3.78
		Std. Deviation	4.11	8.51	6.52	-	-	6.60
		Median	0.72	2.24	0.78	4.07	1.90	1.54
		Maximum	13.58	33.61	22.67	4.07	1.90	33.61
		Minimum	0.13	0.43	0.35	4.07	1.90	0.13
	Panipat	N	8	23	3	3	-	37
		Mean	5.97	2.83	1.47	1.21	-	3.27
		Std. Deviation	9.97	2.61	0.93	0.79	-	5.09
		Median	1.23	1.57	1.62	1.45	-	1.52
		Maximum	29.44	9.78	2.32	1.85	-	29.44
		Minimum	0.53	0.19	0.48	0.33	-	0.19
	Rewari	N	-	4	4	-	-	8
		Mean	-	12.52	4.33	-	-	8.43
		Std. Deviation	-	13.02	3.77	-	-	9.90
		Median	-	8.50	4.23	-	-	7.01
		Maximum	-	31.33	7.88	-	-	31.33
		Minimum	-	1.75	0.99	-	-	0.99
	Sonipat	N	1	2	1	1	-	5
		Mean	19.49	3.20	0.27	0.44	-	5.32
		Std. Deviation	-	1.12	-	-	-	8.07
		Median	19.49	3.20	0.27	0.44	-	2.41
		Maximum	19.49	4.00	0.27	0.44	-	19.49
		Minimum	19.49	2.41	0.27	0.44	-	0.27

A8.2.1 Contd./-

A8.2.1 Continued

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
	Total	N	33	62	33	11	4	143
		Mean	3.37	3.85	2.37	1.35	1.11	3.13
		Std. Deviation	6.28	5.94	4.15	1.08	0.72	5.36
		Median	0.94	1.91	0.94	1.44	1.20	1.24
		Maximum	29.44	33.61	22.67	4.07	1.90	33.61
		Minimum	0.05	0.13	0.03	0.33	0.16	0.03
Northern plain, hot subhumid (dry) region	Kurukshetra	N	3	2	2	2	1	10
		Mean	0.50	2.02	0.51	0.68	1.91	0.98
		Std. Deviation	0.31	1.58	0.37	0.06	.-	0.89
		Median	0.65	2.02	0.51	0.68	1.91	0.71
		Maximum	0.71	3.14	0.77	0.72	1.91	3.14
		Minimum	0.15	0.91	0.25	0.63	1.91	0.15
	Yamuna Nagar	N	-	5	3	-	-	8
		Mean	-	2.33	2.27	-	-	2.31
		Std. Deviation	-	1.14	0.66	-	-	0.93
		Median	-	2.24	2.10	-	-	2.17
		Maximum	-	3.54	3.01	-	-	3.54
		Minimum	-	1.20	1.71	-	-	1.20
	Total	N	3	7	5	2	1	18
		Mean	0.50	2.24	1.57	0.68	1.91	1.57
		Std. Deviation	0.31	1.14	1.09	0.06	-	1.11
		Median	0.65	2.24	1.71	0.68	1.91	1.21
		Maximum	0.71	3.54	3.01	0.72	1.91	3.54
		Minimum	0.15	0.91	0.25	0.63	1.91	0.15
Total	Total	N	42	89	58	30	13	232
		Mean	3.16	3.34	2.67	1.52	1.79	2.82
		Std. Deviation	5.71	5.12	4.03	1.54	1.86	4.54
		Median	0.94	1.73	0.96	1.13	1.24	1.23
		Maximum	29.44	33.61	22.67	7.35	5.96	33.61
		Minimum	0.05	0.08	0.03	0.05	0.16	0.03

A8.3 Average weighted cost of production loss per unit of electricity not available in Karnataka (Rs/kWh)

Statistics	Land holding category					
	M (Marginal)	S (Small)	SM (Semi-medium)	ME (Medium)	L (Large)	Total
N	72	142	131	85	32	462
Mean	9.73	5.75	6.90	3.37	2.57	5.80
Std. Deviation	50.67	9.42	31.05	5.74	4.12	25.79
5% trimmed mean	3.89	4.29	3.10	2.47	2.03	3.21
Median	1.42	2.65	1.77	1.02	1.04	1.77
Maximum	873.24	225.37	396.99	59.77	47.75	873.24
Minimum	0.01	0.07	0.03	0.01	0.04	0.01

A8.3.1 Average weighted cost of production loss per unit of electricity not available in Karnataka by districts under each agro-ecological zone (Rs/kWh)

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
Zone 3: Deccan Plateau, hot-arid region	Bellary	N	3	10	14	14	8	49
		Mean	10.29	6.10	2.94	3.44	2.76	3.777
		Std. Deviation	6.47	7.32	4.97	5.71	3.23	5.658
		Median	15.10	2.33	0.90	0.76	1.29	1.255
		Maximum	15.10	26.21	19.93	26.78	8.92	26.78
		Minimum	0.64	0.67	0.04	0.09	0.04	0.036
	Chitradurga	N	11	18	10	7	2	48
		Mean	23.12	10.60	2.20	1.84	0.93	9.123
		Std. Deviation	105.46	17.09	1.71	1.57	0.10	49.76
		Median	0.40	1.33	1.85	1.02	0.84	1.328
		Maximum	873.24	49.94	6.49	4.46	1.04	873.2
		Minimum	0.01	0.17	0.03	0.20	0.84	0.013
	Total	N	14	28	24	21	10	97
		Mean	21.38	8.94	2.67	2.89	2.31	6.237
		Std. Deviation	98.13	14.45	4.11	4.78	2.92	34.11
		Median	0.74	2.33	1.29	0.89	1.04	1.255
		Maximum	873.24	49.94	19.93	26.78	8.92	873.2
		Minimum	0.01	0.17	0.03	0.09	0.04	0.013
Zone 6: Deccan Plateau, semi-arid region	Belgaum	N	5	31	11	9	4	60
		Mean	4.12	5.45	1.87	4.30	2.61	3.826
		Std. Deviation	8.31	5.29	3.57	7.45	3.65	5.811
		Median	2.34	3.88	0.22	1.13	0.84	2.041
		Maximum	55.85	38.55	20.80	26.95	16.18	55.85
		Minimum	0.49	0.11	0.19	0.70	0.84	0.112
	Bidar	N	1	7	9	4	1	22
		Mean	0.80	5.57	45.44	7.71	2.05	21.82
		Std. Deviation	-	3.36	98.60	9.39	-	67.27
		Median	0.80	4.90	3.75	5.63	2.05	3.474
		Maximum	0.80	12.79	306.56	28.88	2.05	306.6
		Minimum	0.80	0.71	0.59	1.59	2.05	0.586
	Dharwad	N	8	12	17	9	4	50
		Mean	10.44	4.51	5.24	3.44	3.07	5.187
		Std. Deviation	15.81	5.48	3.69	4.64	1.42	7.215
		Median	2.86	3.60	4.89	1.50	3.09	3.437
		Maximum	55.87	32.15	15.98	42.15	4.97	55.87
		Minimum	0.75	0.07	1.15	0.01	1.15	0.01
	Gulbarga	N	7	26	36	30	11	110
		Mean	13.39	3.81	5.02	2.60	3.05	4.081
		Std. Deviation	49.52	4.81	8.13	6.15	7.14	12.8
		Median	1.22	0.91	1.48	0.63	0.89	1.014
		Maximum	300.31	17.73	65.63	59.77	47.75	300.3
		Minimum	0.55	0.19	0.41	0.04	0.05	0.045

A8.3.1 Contd./-

A8.3.1 Continued

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
	Total	N	21	76	73	52	20	242
		Mean	7.30	4.86	9.36	3.58	2.85	6.023
		Std. Deviation	22.70	5.15	38.49	6.67	5.02	23.38
		Median	2.34	3.66	2.38	1.24	1.15	2.344
		Maximum	300.31	38.55	306.56	59.77	47.75	306.6
		Minimum	0.49	0.07	0.19	0.01	0.05	0.01
Zone 7: Deccan (Telangana) Plateau and Eastern Ghats	Raichur	N	5	6	11	1	-	23
		Mean	22.33	3.28	4.14	9.66	-	7.118
		Std. Deviation	20.94	4.76	3.70	-	-	11.28
		Median	13.04	0.50	2.75	9.66	-	3.082
		Maximum	53.89	23.36	11.76	9.66	-	53.89
		Minimum	1.32	0.50	0.20	9.66	-	0.203
	Total	N	5	6	11	1	-	23
		Mean	22.33	3.28	4.14	9.66	-	7.118
		Std. Deviation	20.94	4.76	3.70	-	-	11.28
		Median	13.04	0.50	2.75	9.66	-	3.082
		Maximum	53.89	23.36	11.76	9.66	-	53.89
		Minimum	1.32	0.50	0.20	9.66	-	0.203
Zone 8: Eastern Ghats, TN uplands and Deccan (Karnataka region)	Mandya	N	6	6	6	1	-	19
		Mean	7.58	12.01	11.46	4.38	-	9.957
		Std. Deviation	9.64	9.97	10.82	0.00	-	10.12
		Median	2.65	8.52	3.82	4.38	-	3.818
		Maximum	34.21	33.52	33.04	4.38	-	34.21
		Minimum	0.31	2.67	2.72	4.38	-	0.314
	Mysore	N	13	15	11	5	-	44
		Mean	2.07	3.21	2.94	4.24	-	2.962
		Std. Deviation	1.91	3.51	3.20	5.29	-	3.465
		Median	1.01	2.18	1.63	1.26	-	1.634
		Maximum	6.78	16.28	24.39	13.90	-	24.39
		Minimum	0.22	0.08	0.16	0.45	-	0.078
	Tumkur	N	3	6	5	3	1	18
		Mean	1.55	2.04	0.85	2.16	0.13	1.603
		Std. Deviation	1.61	3.65	1.60	1.56	-	2.388
		Median	1.08	0.34	0.26	3.65	0.13	0.662
		Maximum	7.13	11.73	5.37	3.65	0.13	11.73
		Minimum	1.08	0.15	0.14	0.35	0.13	0.132
	Total	N	22	27	22	9	1	81
		Mean	2.84	4.03	3.86	3.37	0.13	3.526
		Std. Deviation	4.63	5.70	6.26	4.10	-	5.365
		Median	1.11	2.18	1.63	1.26	0.13	1.553
		Maximum	34.21	33.52	33.04	13.90	0.13	34.21
		Minimum	0.22	0.08	0.14	0.35	0.13	0.078

A8.3.1 Contd./-

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
Zone 19: Western Ghats and coastal plains	Coorg	N	-	-	-	2	1	3
		Mean	-	-	-	3.92	3.62	3.823
		Std. Deviation	-	-	-	3.99	-	3.281
		Median	-	-	-	2.44	3.62	2.444
		Maximum	-	-	-	14.70	3.62	14.7
		Minimum	-	-	-	2.44	3.62	2.444
	Dakshina Kannada	N	10	5	1	-	-	16
		Mean	40.78	15.32	396.99	-	-	46.44
		Std. Deviation	81.32	32.26	-	-	-	100.3
		Median	6.37	6.03	396.99	-	-	9.066
		Maximum	258.23	225.37	396.99	-	-	397
		Minimum	0.16	0.57	396.99	-	-	0.163
	Total	N	10	5	1	2	1	19
		Mean	40.78	15.32	396.99	3.92	3.62	23.32
		Std. Deviation	81.32	32.26	-	3.99	-	71.1
		Median	6.37	6.03	396.99	2.44	3.62	3.621
		Maximum	258.23	225.37	396.99	14.70	3.62	397
		Minimum	0.16	0.57	396.99	2.44	3.62	0.163
Total	Total	N	72	142	131	85	32	462
		Mean	9.73	5.75	6.90	3.37	2.57	5.805
		Std. Deviation	50.67	9.42	31.05	5.74	4.12	25.79
		Median	1.42	2.65	1.77	1.02	1.04	1.774
		Maximum	873.24	225.37	396.99	59.77	47.75	873.2
		Minimum	0.01	0.07	0.03	0.01	0.04	0.01

A8.4 Average unweighted cost of production loss per unit of electricity not available in Karnataka (Rs/kWh)

Statistics	Land holding category					
	M	S	SM	ME	L	Total
N	72	142	131	85	32	462
Mean	31.90	7.77	11.30	6.59	5.22	12.14
Std. Deviation	111.66	20.16	43.80	10.84	9.71	51.86
5% trimmed mean	12.38	5.13	5.03	4.98	3.50	5.57
Median	4.40	3.39	2.75	1.76	2.42	2.89
Maximum	873.24	225.37	396.99	59.77	47.75	873.24
Minimum	0.01	0.07	0.03	0.01	0.04	0.01

A8.4.1 Average unweighted cost of production loss per unit of electricity not available in Karnataka by agro-ecological zones and districts (Rs/kWh)

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
Zone 3: Deccan Plateau, hot-arid region	Bellary	N	3	10	14	14	8	49
		Mean	5.95	8.47	2.70	6.06	2.69	5.0
		Std. Deviation	7.96	8.99	5.26	9.53	3.36	7.5
		Median	2.12	5.30	1.01	0.82	0.89	1.3
		Maximum	15.10	26.21	19.93	26.78	8.92	26.8
		Minimum	0.64	0.67	0.04	0.09	0.04	-
	Chitradurga	N	11	18	10	7	2	48
		Mean	99.02	6.05	2.15	1.66	0.94	25.7
		Std. Deviation	258.76	12.24	2.01	1.47	0.14	126.2
		Median	12.88	0.95	1.65	1.02	0.94	1.2
		Maximum	873.24	49.94	6.49	4.46	1.04	873.2
		Minimum	0.01	0.17	0.03	0.20	0.84	-
	Total	N	14	28	24	21	10	97
		Mean	79.07	6.92	2.47	4.59	2.34	15.3
		Std. Deviation	230.40	11.07	4.16	8.01	3.05	89.1
		Median	8.42	1.63	1.19	0.89	0.94	1.3
		Maximum	873.24	49.94	19.93	26.78	8.92	873.2
		Minimum	0.01	0.17	0.03	0.09	0.04	-
Zone 6: Deccan Plateau, semi-arid region	Belgaum	N	5	31	11	9	4	60
		Mean	13.75	7.47	4.25	6.94	6.65	7.3
		Std. Deviation	23.66	9.35	6.13	9.36	6.62	10.4
		Median	2.90	4.85	1.42	1.63	4.79	3.8
		Maximum	55.85	38.55	20.80	26.95	16.18	55.9
		Minimum	0.49	0.11	0.19	0.70	0.84	0.1
	Bidar	N	1	7	9	4	1	22
		Mean	0.80	6.05	41.79	9.69	2.05	20.9
		Std. Deviation	.-	4.23	99.95	12.91	.-	64.5
		Median	0.80	4.90	5.74	4.14	2.05	4.6
		Maximum	0.80	12.79	306.56	28.88	2.05	306.6

A8.4.1 Contd./-

A8.4.1 Continued

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
		Minimum	0.80	0.71	0.59	1.59	2.05	0.6
	Dharwad	N	8	12	17	9	4	50
		Mean	12.71	6.66	5.73	7.72	3.37	7.2
		Std. Deviation	18.53	8.62	3.85	13.38	1.67	10.3
		Median	5.86	4.19	5.23	4.01	3.67	4.2
		Maximum	55.87	32.15	15.98	42.15	4.97	55.9
		Minimum	0.75	0.07	1.15	0.01	1.15	.
	Gulbarga	N	7	26	36	30	11	110
		Mean	56.57	4.56	7.90	7.61	8.89	10.2
		Std. Deviation	110.64	4.99	12.10	13.68	15.52	30.8
		Median	6.85	3.36	3.70	1.81	2.80	2.8
		Maximum	300.31	17.73	65.63	59.77	47.75	300.3
		Minimum	0.55	0.19	0.41	0.04	0.05	.
	Total	N	21	76	73	52	20	242
		Mean	27.01	6.21	11.02	7.67	6.99	9.8
		Std. Deviation	66.11	7.57	36.42	12.59	11.84	29.2
		Median	2.90	3.98	3.96	1.85	3.43	3.6
		Maximum	300.31	38.55	306.56	59.77	47.75	306.6
		Minimum	0.49	0.07	0.19	0.01	0.05	.
Zone 7: Deccan (Telangana) Plateau and Eastern Ghats	Raichur	N	5	6	11	1	-	23
		Mean	26.47	6.37	5.06	9.66	-	10.3
		Std. Deviation	24.56	8.74	3.91	.-	-	14.5
		Median	13.04	3.01	3.82	9.66	-	4.2
		Maximum	53.89	23.36	11.76	9.66	-	53.9
		Minimum	1.32	0.50	0.20	9.66	-	0.2
	Total	N	5	6	11	1	-	23
		Mean	26.47	6.37	5.06	9.66	-	10.3
		Std. Deviation	24.56	8.74	3.91	.-	-	14.5
		Median	13.04	3.01	3.82	9.66	-	4.2
		Maximum	53.89	23.36	11.76	9.66	-	53.9
		Minimum	1.32	0.50	0.20	9.66	-	0.2
Zone 8: Eastern Ghats, TN uplands and Deccan (Karnataka region)	Mandya	N	6	6	6	1	-	19
		Mean	10.73	11.34	16.43	4.38	-	12.4
		Std. Deviation	12.69	12.24	11.77	.-	-	11.6
		Median	7.08	5.84	17.47	4.38	-	8.5
		Maximum	34.21	33.52	33.04	4.38	-	34.2
		Minimum	0.31	2.67	2.72	4.38	-	0.3
	Mysore	N	13	15	11	5	-	44
		Mean	2.51	4.08	5.26	5.75	-	4.1
		Std. Deviation	2.27	4.54	7.10	6.68	-	5.0
		Median	1.24	2.18	2.46	1.26	-	2.2
		Maximum	6.78	16.28	24.39	13.90	-	24.4
		Minimum	0.22	0.08	0.16	0.45	-	0.1
	Tumkur	N	3	6	5	3	1	18
		Mean	3.11	3.02	1.36	1.55	0.13	2.2

A8.4.1 Contd./-

A8.4.1 Continued

Agro-ecological zone	District	Statistics	Land holding category					
			M	S	SM	ME	L	Total
		Std. Deviation	3.48	4.64	2.25	1.83	.-	3.2
		Median	1.11	0.56	0.27	0.66	0.13	0.7
		Maximum	7.13	11.73	5.37	3.65	0.13	11.7
		Minimum	1.08	0.15	0.14	0.35	0.13	0.1
	Total	N	22	27	22	9	1	81
		Mean	4.83	5.46	7.42	4.20	0.13	5.6
		Std. Deviation	7.49	7.38	9.61	5.23	.-	7.8
		Median	2.22	2.67	3.18	1.26	0.13	2.4
		Maximum	34.21	33.52	33.04	13.90	0.13	34.2
		Minimum	0.22	0.08	0.14	0.35	0.13	0.1
Zone 19: Western Ghats and coastal plains	Coorg	N	-	-	-	2	1	3
		Mean	-	-	-	8.57	3.62	6.9
		Std. Deviation	-	-	-	8.67 .		6.8
		Median	-	-	-	8.57	3.62	3.6
		Maximum	-	-	-	14.70	3.62	14.7
		Minimum	-	-	-	2.44	3.62	2.4
	Dakshina Kannada	N	10	5	1	-	-	16
		Mean	38.38	50.39	396.99	-	-	64.5
		Std. Deviation	78.67	98.08	.-	-	-	119.0
		Median	10.50	6.03	396.99	-	-	10.5
		Maximum	258.23	225.37	396.99	-	-	397.0
		Minimum	0.16	0.57	396.99	-	-	0.2
	Total	N	10	5	1	2	1	19
		Mean	38.38	50.39	396.99	8.57	3.62	55.4
		Std. Deviation	78.67	98.08	.-	8.67	.-	110.8
		Median	10.50	6.03	396.99	8.57	3.62	9.1
		Maximum	258.23	225.37	396.99	14.70	3.62	397.0
		Minimum	0.16	0.57	396.99	2.44	3.62	0.2
Total	Total	N	72	142	131	85	32	462
		Mean	31.90	7.77	11.30	6.59	5.22	12.1
		Std. Deviation	111.66	20.16	43.80	10.84	9.71	51.9
		Median	4.40	3.39	2.75	1.76	2.42	2.9
		Maximum	873.24	225.37	396.99	59.77	47.75	873.2
		Minimum	0.01	0.07	0.03	0.01	0.04	-

Method 2

A8.5 Average weighted cost of irrigation using diesel pumpsets by land holding categories in Haryana (kWh)

Land holding category	Statistics	Unit cost (fuel only)	Unit cost (including fuel and maintenance)	Unit cost (including fuel, maintenance and capital)
M (Marginal)	N	79	79	79
	Mean	2.37	3.16	4.12
	Std. Deviation	0.57	1.27	2.25
	5% trimmed mean	2.31	3.02	3.83
	Median	2.09	2.77	3.38
	Maximum	4.19	16.32	25.32
	Minimum	1.68	2.01	2.19
S (Small)	N	129	129	129
	Mean	2.45	3.16	3.95
	Std. Deviation	0.62	0.97	1.59
	5% trimmed mean	2.40	3.07	3.79
	Median	2.09	3.01	3.54
	Maximum	4.86	9.27	14.38
	Minimum	1.68	2.01	2.14
SM (Semi-medium)	N	105	105	105
	Mean	2.76	3.40	4.24
	Std. Deviation	0.86	1.03	1.58
	5% trimmed mean	2.69	3.33	4.12
	Median	2.79	3.41	3.91
	Maximum	5.59	8.08	12.71
	Minimum	1.68	2.07	2.32
ME (Medium)	N	80	80	80
	Mean	2.83	3.34	3.99
	Std. Deviation	1.28	1.39	1.80
	5% trimmed mean	2.67	3.17	3.78
	Median	2.51	2.93	3.32
	Maximum	9.43	9.63	14.01
	Minimum	1.68	2.18	2.28
L (Large)	N	39	39	39
	Mean	2.51	2.94	3.36
	Std. Deviation	0.54	0.65	0.89
	5% trimmed mean	2.51	2.92	3.31
	Median	2.51	3.15	3.29
	Maximum	3.35	5.03	7.12
	Minimum	1.56	2.08	2.19
Total	N	432	432	432
	Mean	2.61	3.25	4.01
	Std. Deviation	0.88	1.12	1.71
	5% trimmed mean	2.51	3.13	3.84
	Median	2.51	3.01	3.51
	Maximum	9.43	16.32	25.32
	Minimum	1.56	2.01	2.14

A8.6 Average unweighted cost of irrigation using diesel pumpsets by land holding categories in Haryana (Rs/kWh)

Land holding category	Statistics	Unit cost (fuel only)	Unit cost (fuel and maintenance)	Unit cost (fuel, maintenance and capital)
M (Marginal)	N	79	79	79
	Mean	2.52	3.99	5.77
	Std. Deviation	0.66	2.16	3.93
	5% Trimmed Mean	2.47	3.70	5.27
	Median	2.31	3.65	4.40
	Maximum	4.19	16.32	25.32
	Minimum	1.68	2.01	2.19
S (Small)	N	129	129	129
	Mean	2.45	3.52	4.72
	Std. Deviation	0.65	1.35	2.27
	5% Trimmed Mean	2.40	3.38	4.46
	Median	2.09	3.12	4.06
	Maximum	4.86	9.27	14.38
	Minimum	1.68	2.01	2.14
SM (Semi-medium)	N	105	105	105
	Mean	2.81	3.79	4.99
	Std. Deviation	0.80	1.21	1.96
	5% Trimmed Mean	2.75	3.72	4.86
	Median	2.79	3.63	4.59
	Maximum	5.59	8.08	12.71
	Minimum	1.68	2.07	2.32
ME (Medium)	N	80	80	80
	Mean	2.64	3.35	4.34
	Std. Deviation	1.12	1.30	2.15
	5% Trimmed Mean	2.47	3.17	4.06
	Median	2.31	3.02	3.58
	Maximum	9.43	9.63	14.01
	Minimum	1.68	2.18	2.28
L (Large)	N	39	39	39
	Mean	2.42	3.05	3.60
	Std. Deviation	0.59	0.69	1.01
	5% Trimmed Mean	2.42	3.02	3.54
	Median	2.51	3.21	3.66
	Maximum	3.35	5.03	7.12
	Minimum	1.56	2.08	2.19
Total	N	432	432	432
	Mean	2.58	3.60	4.81
	Std. Deviation	0.80	1.47	2.56
	5% Trimmed Mean	2.50	3.44	4.50
	Median	2.51	3.26	4.13
	Maximum	9.43	16.32	25.32
	Minimum	1.56	2.01	2.14

A8.7 Average weighted cost of irrigation using electrical pumpsets by land holding categories in Haryana (kWh)

Land holding category	Statistics	Unit cost (fuel only)	Unit cost (fuel and maintenance)	Unit cost (fuel, maintenance and capital)
M (Marginal)	N	83	83	83
	Mean	1.86	2.61	4.57
	Std. Deviation	1.93	2.66	5.02
	5% trimmed mean	1.61	2.28	3.92
	Median	1.48	2.06	3.85
	Maximum	16.10	26.51	40.91
	Minimum	0.19	0.34	0.41
S (Small)	N	129	129	129
	Mean	1.64	2.25	4.20
	Std. Deviation	1.37	1.62	3.29
	5% trimmed mean	1.50	2.20	3.84
	Median	1.34	2.09	3.79
	Maximum	13.08	17.55	30.53
	Minimum	0.17	0.28	0.53
SM (Semi-medium)	N	101	101	101
	Mean	1.23	1.69	3.06
	Std. Deviation	1.01	1.08	2.56
	5% trimmed mean	1.09	1.57	2.76
	Median	0.95	1.39	2.39
	Maximum	13.48	9.81	37.41
	Minimum	0.21	0.48	0.67
ME (Medium)	N	68	68	68
	Mean	1.12	1.22	2.20
	Std. Deviation	1.16	0.90	1.93
	5% trimmed mean	0.97	1.14	1.94
	Median	0.76	1.09	1.47
	Maximum	5.90	6.43	15.99
	Minimum	0.13	0.26	0.61
L (Large)	N	40	40	40
	Mean	1.98	2.05	2.49
	Std. Deviation	1.31	1.42	1.53
	5% trimmed mean	1.85	1.95	2.30
	Median	1.43	1.46	1.87
	Maximum	9.30	4.39	10.68
	Minimum	0.66	0.62	1.07
Total	N	421	421	421
	Mean	1.48	1.83	3.31
	Std. Deviation	1.36	1.56	3.15
	5% trimmed mean	1.32	1.66	2.92
	Median	1.15	1.48	2.52
	Maximum	16.10	26.51	40.91
	Minimum	0.13	0.26	0.41

A8.8 Average unweighted cost of irrigation using electric pumpsets by land holding categories in Haryana (Rs/kWh)

Land holding category	Statistics	Unit cost (fuel)	Unit cost (fuel and maintenance)	Units cost (fuel, maintenance and capital)
M (Marginal)	N	83	83	83
	Mean	3.68	5.05	9.71
	Std. Deviation	2.99	4.35	8.35
	5% Trimmed Mean	3.43	4.53	8.77
	Median	2.81	3.60	7.08
	Maximum	16.10	26.51	40.91
	Minimum	0.19	0.34	0.41
S (Small)	N	129	129	129
	Mean	2.59	3.34	6.29
	Std. Deviation	2.32	2.43	4.83
	5% Trimmed Mean	2.29	3.08	5.74
	Median	2.09	2.68	4.87
	Maximum	13.08	17.55	30.53
	Minimum	0.17	0.28	0.53
SM (Semi-medium)	N	101	101	101
	Mean	2.30	2.70	5.94
	Std. Deviation	2.44	1.94	7.04
	5% Trimmed Mean	1.94	2.51	4.77
	Median	1.40	2.01	3.51
	Maximum	13.48	9.81	37.41
	Minimum	0.21	0.48	0.67
ME (Medium)	N	68	68	68
	Mean	2.28	2.55	4.04
	Std. Deviation	1.63	1.17	2.96
	5% Trimmed Mean	2.21	2.40	3.76
	Median	1.74	1.93	3.25
	Maximum	5.90	6.43	15.99
	Minimum	0.13	0.26	0.61
L (Large)	N	40	40	40
	Mean	2.91	3.12	3.52
	Std. Deviation	2.34	0.85	2.69
	5% Trimmed Mean	2.68	2.83	3.26
	Median	2.41	1.66	3.05
	Maximum	9.30	4.39	10.68
	Minimum	0.66	0.62	1.07
Total	N	421	421	421
	Mean	2.72	3.17	6.25
	Std. Deviation	2.45	2.79	6.20
	5% Trimmed Mean	2.42	2.81	5.34
	Median	2.05	2.36	4.36
	Maximum	16.10	26.51	40.91
	Minimum	0.13	0.26	0.41

A8.9 Average weighted cost of irrigation using diesel pumpsets by land holding categories in Karnataka (Rs/kWh)

Land holding category	Statistics	Unit cost (fuel only)	Unit cost (fuel and maintenance)	Unit cost (fuel, maintenance and capital)
M (Marginal)	N	4	4	4
	Mean	6.63	11.47	16.54
	Std. Deviation	2.28	5.46	7.31
	5% Trimmed Mean	6.67	11.13	15.82
	Median	6.22	9.69	14.10
	Maximum	9.35	24.11	34.22
	Minimum	3.13	5.08	11.86
S (Small)	N	8	8	8
	Mean	5.51	6.75	11.83
	Std. Deviation	1.33	1.20	4.70
	5% Trimmed Mean	5.41	6.73	11.59
	Median	5.77	6.73	13.04
	Maximum	8.99	9.31	22.83
	Minimum	3.74	4.43	5.13
SM (Semi-medium)	N	8	8	8
	Mean	3.39	4.62	7.71
	Std. Deviation	1.90	2.22	2.82
	5% Trimmed Mean	3.26	4.43	7.37
	Median	2.41	3.72	7.69
	Maximum	7.64	10.42	19.23
	Minimum	1.57	2.99	4.75
ME (Medium)	N	3	3	3
	Mean	5.27	9.85	14.07
	Std. Deviation	0.98	3.23	1.19
	5% Trimmed Mean	5.27	9.91	14.10
	Median	4.58	11.95	14.78
	Maximum	6.43	12.92	15.06
	Minimum	4.24	5.63	12.51
Total	N	21	21	21
	Mean	4.40	6.09	10.01
	Std. Deviation	2.09	3.20	4.83
	5% Trimmed Mean	4.27	5.79	9.56
	Median	3.75	5.63	7.86
	Maximum	9.35	24.11	34.22
	Minimum	1.57	2.99	4.75

A8.10 Average unweighted cost of irrigation using diesel pumpsets by land holding categories in Karnataka (Rs/kWh)

Land holding category	Statistics	Unit cost (fuel only)	Unit cost (fuel and maintenance)	Unit cost (fuel, maintenance and capital)
M (Medium)	N	4	4	4
	Mean	5.82	12.48	19.24
	Std. Deviation	2.67	8.16	10.18
	5% Trimmed Mean	5.77	12.25	18.82
	Median	5.40	10.37	15.44
	Maximum	9.35	24.11	34.22
	Minimum	3.13	5.08	11.86
S (Small)	N	6	6	6
	Mean	5.52	6.99	13.02
	Std. Deviation	1.94	1.63	6.17
	5% Trimmed Mean	5.43	7.00	12.91
	Median	5.38	6.96	13.75
	Maximum	8.99	9.31	22.83
	Minimum	3.74	4.43	5.13
SM (Semi-medium)	N	8	8	8
	Mean	3.88	5.73	9.63
	Std. Deviation	2.28	2.93	4.90
	5% Trimmed Mean	3.80	5.62	9.37
	Median	2.78	4.20	7.91
	Maximum	7.64	10.42	19.23
	Minimum	1.57	2.99	4.75
ME (Medium)	N	3	3	3
	Mean	5.08	10.16	14.12
	Std. Deviation	1.18	3.96	1.40
	5% Trimmed Mean	-	-	-
	Median	4.58	11.95	14.78
	Maximum	6.43	12.92	15.06
	Minimum	4.24	5.63	12.51
Total	N	21	21	21
	Mean	4.89	8.01	13.07
	Std. Deviation	2.16	4.73	6.80
	5% Trimmed Mean	4.83	7.42	12.39
	Median	4.58	7.19	13.04
	Maximum	9.35	24.11	34.22
	Minimum	1.57	2.99	4.75

A8.11 Average weighted cost of irrigation using electric pumpsets by land holding categories in Karnataka (Rs/kWh)

Land holding category	Statistics	Unit cost (fuel)	Unit cost (fuel and maintenance only)	Unit cost (fuel, maintenance and capital)
M	N	122	122	122
	Mean	0.36	0.94	2.88
	Std. Deviation	0.48	1.68	6.07
	5% trimmed mean	0.29	0.71	2.14
	Median	0.25	0.53	1.59
	Maximum	18.75	71.88	263.85
	Minimum	0.07	0.15	0.22
S	N	219	219	219
	Mean	0.36	1.12	2.82
	Std. Deviation	0.48	2.02	4.36
	5% trimmed mean	0.30	0.85	2.31
	Median	0.25	0.64	1.69
	Maximum	18.75	81.25	287.21
	Minimum	0.07	0.14	0.41
SM	N	195	195	195
	Mean	0.30	0.97	2.31
	Std. Deviation	0.33	1.19	3.07
	5% trimmed mean	0.25	0.80	1.90
	Median	0.23	0.66	1.79
	Maximum	5.00	25.56	57.39
	Minimum	0.08	0.17	0.19
ME	N	113	113	113
	Mean	0.31	0.98	2.54
	Std. Deviation	0.41	1.38	4.54
	5% trimmed mean	0.25	0.77	1.93
	Median	0.21	0.71	1.64
	Maximum	10.00	25.33	61.14
	Minimum	0.08	0.08	0.32
L	N	47	47	47
	Mean	0.31	0.76	1.83
	Std. Deviation	0.33	0.65	1.72
	5% trimmed mean	0.26	0.69	1.61
	Median	0.20	0.63	1.40
	Maximum	3.00	7.00	17.74
	Minimum	0.08	0.13	0.20
Total	N	696	696	696
	Mean	0.33	0.99	2.51
	Std. Deviation	0.41	1.51	4.11
	5% trimmed mean	0.27	0.78	1.99
	Median	0.23	0.63	1.68
	Maximum	18.75	81.25	287.21
	Minimum	0.07	0.08	0.19

A8.12 Average unweighted cost of irrigation using electric pumpsets by land holding categories in Karnataka (Rs/kWh)

Land holding category	Statistics	Unit cost (fuel only)	Unit cost (fuel and maintenance only)	Unit cost (fuel, maintenance and capital)
M	N	4	4	4
	Mean	6.63	11.47	16.54
	Std. Deviation	2.28	5.46	7.31
	5% trimmed mean	6.67	11.12	15.82
	Median	6.22	9.69	14.10
	Maximum	9.35	24.11	34.22
	Minimum	3.13	5.08	11.86
S	N	7	7	7
	Mean	5.41	6.66	11.79
	Std. Deviation	1.40	1.26	4.62
	5% trimmed mean	5.34	6.64	11.54
	Median	5.77	6.73	13.04
	Maximum	8.99	9.31	22.83
	Minimum	2.73	4.30	5.13
SM	N	12	12	12
	Mean	3.06	4.20	7.00
	Std. Deviation	1.52	1.72	2.32
	5% trimmed mean	2.88	3.99	6.72
	Median	2.41	3.72	5.95
	Maximum	7.64	10.42	19.23
	Minimum	1.57	2.99	4.75
ME	N	8	8	8
	Mean	5.31	9.28	8.57
	Std. Deviation	2.46	2.84	2.85
	5% trimmed mean	5.29	9.21	8.27
	Median	4.58	8.14	7.38
	Maximum	8.27	13.89	19.24
	Minimum	2.67	5.63	5.30
L	N	4	4	4
	Mean	3.12	3.42	3.13
	Std. Deviation	0.42	1.40	2.58
	5% trimmed mean	3.13	3.29	2.81
	Median	3.36	3.36	2.18
	Maximum	4.88	17.90	25.57
	Minimum	2.50	3.02	2.18
All	N	35	35	35
	Mean	3.91	5.53	6.50
	Std. Deviation	1.93	3.28	4.30
	5% trimmed mean	3.76	5.18	6.07
	Median	3.36	3.72	5.95
	Maximum	9.35	24.11	34.22
	Minimum	1.57	2.99	2.18

ANNEX 9

REGRESSION RESULTS

A 9.1 Econometric analysis of the industry WTP results

Variable Definitions

```
Wtpunit     = WTP for improved supply? (0 or 1)
Lnwtpub     = log (WTP bid)
Paynow      = Total cost of electricity purchased/units consumed
invecsh     = 1/(share of total cost of electricity in total costs)
profit      = imputed profit of company
total_ep    = total kWh of electricity purchased
LT          = LT consumer (0 or 1)
Smalind     = if small LT consumer (0 or 1)
cdkva       = contracted demand or sanctioned load in kVA
SL_KW_1     = sanctioned load in kW
buylt2      = is captive genset less than 2 years old? (0 or 1)
captive     = has some captive generation (0 or 1)
sgensh      = share of captive generation in total electricity use
D_CUT_S     = hours of demand cuts in summer
D_CUT_W     = hours of demand cuts in winter
UN_CUT_S    = hours of unscheduled cuts in summer
UN_CUT_W    = hours of unscheduled cuts in winter
S_CUT_S     = hours of scheduled cuts in summer
S_CUT_W     = hours of scheduled cuts in winter
score_1     = average score (1-5) for voltage fluctuation
score_2     = average score (1-5) for frequency fluctuation
score_3     = average score (1-5) for Scheduled outages
score_4     = average score (1-5) for Unscheduled outages
score_5     = average score (1-5) for Demand cut/ Peak load cut
score_6     = average score (1-5) for There is no response to complaints
score_7     = average score (1-5) Unofficial payments required for repairs
score_8     = average score (1-5) for Getting new connection very difficult
score_9     = average score (1-5) for Getting additional load v. difficult
score_10    = average score (1-5) for "other 1" problems
score_11    = average score (1-5) for "other 2" problems
prod_aff    = is your production affected by supply interruptions? (0 or 1)
hrs_work    = how many hours is your standard work day?
C1          = Circle 1 (see map in main text for name)
C2          = Circle 1 (see map in main text for name)
C3          = Circle 1 (see map in main text for name)
C4          = Circle 1 (see map in main text for name)
C5          = Circle 1 (see map in main text for name)
C6          = Circle 1 (see map in main text for name)
C7          = Circle 1 (see map in main text for name)
C8          = Circle 1 (see map in main text for name)
```

Karnataka - Probit results - unrestricted specification (all variables)

Binomial Probit Model	
Maximum Likelihood Estimates	
Dependent variable	WTPUNIT
Weighting variable	ONE
Number of observations	377
Iterations completed	8
Log likelihood function	-147.1654
Restricted log likelihood	-261.1560
Chi-squared	227.9812
Degrees of freedom	33
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Index function for probability					
Constant	3.015082855	.61792165	4.879	.0000	
PAYNOW	-.8735003065	.10205834	-8.559	.0000	5.3146141
INVECSH	.1200208533E-02	.86715087E-03	1.384	.1663	60.141173
TOTAL_EP	.1917857380E-07	.46652694E-07	.411	.6810	588021.85
LT	-.2748568679	.24179448	-1.137	.2556	.61007958
CDKVA	.4508062462E-04	.14894736E-03	.303	.7621	315.78143
BUYLT2	-.2337864669	.23044944	-1.014	.3104	.20689655
CAPTIVE	.5336619919	.21758679	2.453	.0142	.66578249
SGENSH	-2.162174170	.75878885	-2.850	.0044	.65407415E-01
D_CUT_S	-.1574187039	.89367602E-01	-1.761	.0782	.45897056
D_CUT_W	-.1992318809	.25888531	-.770	.4416	.73040849E-01
UN_CUT_S	.1691933911	.68833984E-01	2.458	.0140	1.7703546
UN_CUT_W	.5447845857	.15149919	3.596	.0003	.52153952
S_CUT_S	.5547751336E-02	.58458466E-01	.095	.9244	2.3728008
S_CUT_W	.1094640937	.20743204	.528	.5977	.16753952
SCORE_1	.2664046695E-01	.53359520E-01	.499	.6176	2.6286721
SCORE_2	.4707328002E-01	.63529578E-01	.741	.4587	1.0557676
SCORE_3	.7976641215E-01	.55818318E-01	1.429	.1530	2.6339748
SCORE_4	-.2647534062E-02	.64179534E-01	-.041	.9671	3.7878056
SCORE_5	.1210665456	.68310250E-01	1.772	.0763	.75339257
SCORE_6	-.5440726251E-02	.58371012E-01	-.093	.9257	1.8064109
SCORE_7	.1763927561E-01	.63114291E-01	.279	.7799	1.6976589
SCORE_8	-.4228258150E-01	.70788465E-01	-.597	.5503	1.9894385
SCORE_9	.1633486855E-01	.68423954E-01	.239	.8113	2.0822748
SCORE_10	-.9725030632E-01	.49683956E-01	-1.957	.0503	.99742467
PROD_AFF	.2317871242	.19565276	1.185	.2361	.71087533
C2	-.2186214107	.46308764	-.472	.6369	.42440318E-01
C3	-.6393415552	.28077326	-2.277	.0228	.11140584
C4	.5505315877	.52687490	1.045	.2961	.37135279E-01
C5	.2480736715	.38390574	.646	.5182	.55702918E-01
C6	-.8891289239E-01	.55934390	-.159	.8737	.34482759E-01
C7	-.4930763885	.33329293	-1.479	.1390	.71618037E-01
C8	-1.278427891	.45826498	-2.790	.0053	.45092838E-01
HRS_WORK	-.1695297891E-01	.16360914E-01	-1.036	.3001	13.148541

Frequencies of actual and predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	145	38	183
1	30	164	194
Total	175	202	377

Karnataka - Probit results - final specification

```
+-------------------------------------------------+
| Binomial Probit Model                           |
| Maximum Likelihood Estimates                    |
| Dependent variable                   WTPUNIT    |
| Weighting variable                       ONE    |
| Number of observations                   377    |
| Iterations completed                       8    |
| Log likelihood function            -148.2550    |
| Restricted log likelihood          -261.1560    |
| Chi-squared                         225.8020    |
| Degrees of freedom                        20    |
| Significance level                  .0000000    |
+-------------------------------------------------+
```

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Index function for probability				
Constant	3.043336159	.60270387	5.049	.0000	
PAYNOW	-.8616521056	.99669530E-01	-8.645	.0000	5.3146141
INVECSH	.1188204214E-02	.84421041E-03	1.407	.1593	60.141173
LT	-.3033834137	.23269900	-1.304	.1923	.61007958
BUYLT2	-.2296904072	.22687694	-1.012	.3113	.20689655
CAPTIVE	.5399065583	.21263097	2.539	.0111	.66578249
SGENSH	-1.913838264	.64011063	-2.990	.0028	.65407415E-01
D_CUT_S	-.1460970319	.85778340E-01	-1.703	.0885	.45897056
D_CUT_W	-.1632002932	.22265941	-.733	.4636	.73040849E-01
UN_CUT_S	.1472259715	.62170717E-01	2.368	.0179	1.7703546
UN_CUT_W	.5417576981	.14408304	3.760	.0002	.52153952
SCORE_2	.5441072489E-01	.57604922E-01	.945	.3449	1.0557676
SCORE_3	.8147959045E-01	.47183357E-01	1.727	.0842	2.6339748
SCORE_5	.1174814600	.66489556E-01	1.767	.0772	.75339257
SCORE_10	-.9924941366E-01	.47283933E-01	-2.099	.0358	.99742467
PROD_AFF	.2116646659	.18859457	1.122	.2617	.71087533
C3	-.6594456183	.26909228	-2.451	.0143	.11140584
C4	.5175070673	.52550949	.985	.3247	.37135279E-01
C7	-.4713233540	.31280504	-1.507	.1319	.71618037E-01
C8	-1.230550757	.42890946	-2.869	.0041	.45092838E-01
HRS_WORK	-.1299427103E-01	.15766385E-01	-.824	.4098	13.148541

Frequencies of actual and predicted outcomes
Predicted outcome has maximum probability.

Actual	Predicted 0	Predicted 1	Total
0	144	39	183
1	30	164	194
Total	174	203	377

Karnataka – OLS bid level results – unrestricted specification (all variables)

```
+----------------------------------------------------------------------+
| Ordinary    least squares regression    Weighting variable = none    |
| Dep. var. = LNWTPUB  Mean=   1.571733492    , S.D.=   .2301022870    |
| Model size: Observations =     180, Parameters =  35, Deg.Fr.=   145 |
| Residuals:  Sum of squares= 5.676389113    , Std.Dev.=        .19786 |
| Fit:        R-squared=  .401068, Adjusted R-squared =         .26063 |
| Model test: F[ 34,     145] =    2.86,     Prob value =        .00001 |
| Diagnostic: Log-L =      55.6888, Restricted(b=0) Log-L =      9.5541 |
|             LogAmemiyaPrCrt.=   -3.063, Akaike Info. Crt.=      -.230 |
| Autocorrel: Durbin-Watson Statistic =   2.12474,    Rho =     -.06237 |
+----------------------------------------------------------------------+
```

Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.059742975	.11815083	8.969	.0000	
PAYNOW	.1231497555	.23206902E-01	5.307	.0000	3.4806281
INVECSH	.7132898367E-04	.96772377E-04	.737	.4623	71.396280
TOTAL_EP	-.7549582468E-07	.55669051E-07	-1.356	.1772	287553.56
LT	-.3019281494E-02	.47911221E-01	-.063	.9498	.70000000
CDKVA	.1119983689E-03	.12787024E-03	.876	.3825	170.43736
BUYLT2	-.1494955465E-01	.41325828E-01	-.362	.7181	.21111111
SGENSH	.1178941897	.21997369	.536	.5928	.26537308E-01
PROFIT	-.5198211032E-02	.83186691E-01	-.062	.9503	.23289978
D_CUT_S	-.5186501624E-02	.17741881E-01	-.292	.7705	.48897222
D_CUT_W	-.1202332853E-01	.49447743E-01	-.243	.8082	.80651111E-01
UN_CUT_S	-.2217167268E-01	.12348154E-01	-1.796	.0746	1.9648400
UN_CUT_W	.4002776512E-01	.22455080E-01	1.783	.0767	.62343833
S_CUT_S	-.1895699322E-02	.10778436E-01	-.176	.8606	2.4488456
S_CUT_W	.7791202602E-02	.38620370E-01	.202	.8404	.20635889
SCORE_1	.3594871574E-02	.10349978E-01	.347	.7288	2.7166883
SCORE_2	-.9193960171E-02	.11269599E-01	-.816	.4159	1.1500628
SCORE_3	.6979643185E-03	.10671532E-01	.065	.9479	2.7944617
SCORE_4	.1062203875E-01	.12780557E-01	.831	.4073	3.8611161
SCORE_5	-.3419364227E-03	.12661927E-01	-.027	.9785	.86674222
SCORE_6	.8538590787E-03	.10420241E-01	.082	.9348	2.0611494
SCORE_7	.9358015488E-02	.11748608E-01	.797	.4270	1.9111522
SCORE_8	.2486998860E-01	.13078006E-01	1.902	.0592	2.2222656
SCORE_9	-.1768959958E-01	.12330928E-01	-1.435	.1536	2.4333733
SCORE_10	.4799561478E-02	.88092938E-02	.545	.5867	.98341111
PROD_AFF	.4411986723E-01	.38450637E-01	1.147	.2531	.74444444
CAPTIVE	-.1288939551E-02	.40384682E-01	-.032	.9746	.69444444
C2	-.1650600475	.79851237E-01	-2.067	.0405	.50000000E-01
C3	-.8420091971E-01	.57547701E-01	-1.463	.1456	.94444444E-01
C4	.2092457386	.89875772E-01	2.328	.0213	.33333333E-01
C5	.1895770649E-01	.70296569E-01	.270	.7878	.61111111E-01
C6	.1400995397	.83823877E-01	1.671	.0968	.44444444E-01
C7	-.8058925079E-01	.64019144E-01	-1.259	.2101	.72222222E-01
C8	-.1776822045	.10982988	-1.618	.1079	.22222222E-01
HRS_WORK	.7997321821E-03	.31234554E-02	.256	.7983	13.252778

Karnataka - OLS bid level results - final specification (all variables)

```
+-----------------------------------------------------------------------+
| Ordinary    least squares regression    Weighting variable = none     |
| Dep. var. = LNWTPUB  Mean=   1.575797976    , S.D.=    .2231410918    |
| Model size: Observations =      228, Parameters =  18, Deg.Fr.=   210 |
| Residuals:  Sum of squares= 6.834668998     , Std.Dev.=        .18041 |
| Fit:        R-squared=  .395310, Adjusted R-squared =          .34636 |
| Model test: F[ 17,     210] =     8.08,    Prob value =        .00000 |
| Diagnostic: Log-L =      76.3185, Restricted(b=0) Log-L =     18.9719 |
|             LogAmemiyaPrCrt.=   -3.349, Akaike Info. Crt.=      -.512 |
| Autocorrel: Durbin-Watson Statistic =   2.07175,    Rho =      -.03587 |
+-----------------------------------------------------------------------+
```

Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.056205724	.62122055E-01	17.002	.0000	
PAYNOW	.1280319894	.14272903E-01	8.970	.0000	3.5461258
TOTAL_EP	-.6942834193E-07	.29437656E-07	-2.358	.0193	585649.52
CDKVA	.1491338542E-03	.63409921E-04	2.352	.0196	320.14682
UN_CUT_S	-.1210818502E-01	.90988402E-02	-1.331	.1847	2.0248763
UN_CUT_W	.1976119914E-01	.15445096E-01	1.279	.2022	.63781404
SCORE_2	-.9530391308E-02	.76960887E-02	-1.238	.2170	1.1009408
SCORE_4	.1229741600E-01	.88686522E-02	1.387	.1670	3.7631645
SCORE_7	.4602618063E-02	.71970792E-02	.640	.5232	1.7675877
SCORE_8	.2322816093E-01	.10460048E-01	2.221	.0274	2.0746079
SCORE_9	-.1581874949E-01	.99542800E-02	-1.589	.1135	2.1930272
PROD_AFF	.3888593737E-01	.28329385E-01	1.373	.1713	.71052632
C2	-.1171300603	.57858123E-01	-2.024	.0442	.52631579E-01
C3	-.6498273688E-01	.42576019E-01	-1.526	.1284	.92105263E-01
C4	.1170076740	.67013856E-01	1.746	.0823	.35087719E-01
C6	.8516984291E-01	.65334362E-01	1.304	.1938	.39473684E-01
C7	-.8174155494E-01	.50395514E-01	-1.622	.1063	.65789474E-01
C8	-.1306354476	.73295610E-01	-1.782	.0761	.35087719E-01

Haryana - Probit results - unrestricted specification (all variables)

Binomial Probit Model	
Maximum Likelihood Estimates	
Dependent variable	WTPUNIT
Weighting variable	ONE
Number of observations	436
Iterations completed	9
Log likelihood function	-249.6567
Restricted log likelihood	-297.1975
Chi-squared	95.08165
Degrees of freedom	31
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Index function for probability					
Constant	.5225268666	.60228632	.868	.3856	
PAYNOW	-.3973137964	.13161248	-3.019	.0025	3.9052081
INVECSH	.3102478780	.15450545	2.008	.0446	.32797571
SL_KW_1	-.7770222419E-06	.51828897E-04	-.015	.9880	477.24106
BUYLT2	-.2979366678E-01	.16289304	-.183	.8549	.21788991
SGENSH	.1290264355	.39238971	.329	.7423	.37975561
PROFIT	.2358706932	.26152297	.902	.3671	-.50166314E-01
D_CUT_S	.2314413123E-01	.77379625E-01	.299	.7649	2.3108172
D_CUT_W	-.5877433215E-01	.78341734E-01	-.750	.4531	2.2213688
UN_CUT_S	-.9062396722E-01	.60718418E-01	-1.493	.1356	3.1569977
UN_CUT_W	.1187135165	.73287672E-01	1.620	.1053	2.1442711
S_CUT_S	.2050688856	.16228227	1.264	.2064	.20192638
S_CUT_W	-.1444924394	.19836066	-.728	.4663	.14367087
SCORE_1	.1744224994E-01	.39077065E-01	.446	.6553	2.4220484
SCORE_2	-.4317891654E-03	.45733090E-01	-.009	.9925	.90374289
SCORE_3	-.6982353075E-01	.51796342E-01	-1.348	.1776	.53219427
SCORE_4	.8618947811E-01	.48730247E-01	1.769	.0769	3.6078064
SCORE_5	.2643547474E-01	.37376198E-01	.707	.4794	1.8922477
SCORE_6	.1035358671E-02	.38709489E-01	.027	.9787	1.3876791
SCORE_7	.9946301620E-01	.40025542E-01	2.485	.0130	1.0551179
SCORE_8	.1912740020E-01	.43513431E-01	.440	.6602	1.4908913
SCORE_9	-.5312520445E-01	.44702741E-01	-1.188	.2347	1.2638312
SCORE_10	-.1039511502	.35175177E-01	-2.955	.0031	1.1675039
SCORE_11	.2172943023	.11499820	1.890	.0588	.87253670E-01
PROD_AFF	.1983764864	.13689409	1.449	.1473	.52293578
CAPTIVE	.2913932198	.28233115	1.032	.3020	.85091743
SMLIND	-.2327827857E-01	.17396859	-.134	.8936	.33027523
C3	-.2344566604	.22510972	-1.042	.2976	.11926606
C4	.5672262057	.18614949	3.047	.0023	.17660550
C7	-.6857969457	.26322335	-2.605	.0092	.10091743
C8	.5524502952	.26126299	2.115	.0345	.82568807E-01
C9	-1.095161907	.40224802	-2.723	.0065	.52752294E-01

Frequencies of actual and predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	198	53	251
1	77	108	185
Total	275	161	436

Haryana - Probit results - final specification

Binomial Probit Model	
Maximum Likelihood Estimates	
Dependent variable	WTPUNIT
Weighting variable	ONE
Number of observations	436
Iterations completed	9
Log likelihood function	-249.6553
Restricted log likelihood	-297.1975
Chi-squared	95.08441
Degrees of freedom	21
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Index function for probability				
Constant	.3620318079	.56335796	.643	.5205	
PAYNOW	-.3832814897	.12883416	-2.975	.0029	3.9052081
INVECSH	.3102392856	.15220295	2.038	.0415	.32797571
TOTAL_EP	-.1344817290E-06	.78689487E-07	-1.709	.0874	499627.93
SL_KW_1	.9311417372E-04	.67191625E-04	1.386	.1658	477.24106
PROFIT	.2315744861	.26736517	.866	.3864	-.50166314E-01
UN_CUT_S	-.8491228728E-01	.59177899E-01	-1.435	.1513	3.1569977
UN_CUT_W	.1155367548	.71553182E-01	1.615	.1064	2.1442711
S_CUT_S	.1723604025	.16458441	1.047	.2950	.20192638
S_CUT_W	-.9601179792E-01	.19800545	-.485	.6278	.14367087
SCORE_3	-.6493445551E-01	.50308506E-01	-1.291	.1968	.53219427
SCORE_4	.9879535390E-01	.46366380E-01	2.131	.0331	3.6078064
SCORE_7	.9147578031E-01	.36293458E-01	2.520	.0117	1.0551179
SCORE_9	-.3675703335E-01	.34390316E-01	-1.069	.2852	1.2638312
SCORE_10	-.1015203470	.34972009E-01	-2.903	.0037	1.1675039
SCORE_11	.1952195289	.11350190	1.720	.0854	.87253670E-01
PROD_AFF	.2088768976	.13500703	1.547	.1218	.52293578
CAPTIVE	.3631748769	.20129909	1.804	.0712	.85091743
C4	.6490988228	.17683881	3.671	.0002	.17660550
C7	-.5789374724	.25394479	-2.280	.0226	.10091743
C8	.6567270411	.24921481	2.635	.0084	.82568807E-01
C9	-.9697234874	.39386893	-2.462	.0138	.52752294E-01

Frequencies of actual and predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	199	52	251
1	79	106	185
Total	278	158	436

Haryana - OLS bid level results - unrestricted specification (all variables)

```
+-----------------------------------------------------------------------+
| Ordinary    least squares regression    Weighting variable = none     |
| Dep. var. = LNWTPUB  Mean=   1.644452822     , S.D.=    .1374097246    |
| Model size: Observations =      185, Parameters =  34, Deg.Fr.=    151 |
| Residuals:  Sum of squares= 2.758760927     , Std.Dev.=         .13517 |
| Fit:        R-squared=  .205925, Adjusted R-squared =          .03239 |
| Model test: F[ 33,    151] =     1.19,    Prob value =          .24288 |
| Diagnostic: Log-L =    126.5120, Restricted(b=0) Log-L =      105.1835 |
|             LogAmemiyaPrCrt.=    -3.834, Akaike Info. Crt.=     -1.000 |
| Autocorrel: Durbin-Watson Statistic =    2.07148,    Rho =      -.03574 |
+-----------------------------------------------------------------------+
```

Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.454960135	.11373763	12.792	.0000	
PAYNOW	.4437025247E-01	.26019864E-01	1.705	.0902	3.7440524
INVECSH	.1589802307E-01	.19547993E-01	.813	.4173	.38414365
TOTAL_EP	.1753186557E-07	.13373235E-07	1.311	.1919	438344.25
SL_KW_1	-.2766700917E-04	.12792356E-04	-2.163	.0321	489.42496
BUYLT2	-.3681882247E-02	.24920901E-01	-.148	.8827	.23783784
SGENSH	.6028470418E-01	.69893180E-01	.863	.3898	.40198807
PROFIT	.7324795085E-02	.84346968E-01	.087	.9309	.18370051
D_CUT_S	-.1163079381E-02	.12113793E-01	-.096	.9236	2.3865238
D_CUT_W	-.1745922007E-02	.10950918E-01	-.159	.8735	2.3135524
UN_CUT_S	-.8724411960E-02	.10663887E-01	-.818	.4146	3.2216227
UN_CUT_W	.5472081788E-02	.12113957E-01	.452	.6521	2.2529751
S_CUT_S	.1747714696E-01	.18971244E-01	.921	.3584	.24873892
S_CUT_W	-.1482625442E-01	.29125581E-01	-.509	.6115	.16387514
SCORE_1	.4309422187E-03	.64241155E-02	.067	.9466	2.6540805
SCORE_2	-.4299989617E-02	.73147711E-02	-.588	.5575	1.0216914
SCORE_3	.1393731701E-01	.87138076E-02	1.599	.1118	.50278811
SCORE_4	.2959612577E-02	.89424977E-02	.331	.7411	3.8594643
SCORE_5	-.4804684189E-02	.56853813E-02	-.845	.3994	2.0649092
SCORE_6	.2251683332E-02	.61841200E-02	.364	.7163	1.4703324
SCORE_7	.2373815469E-02	.59680416E-02	.398	.6914	1.3514162
SCORE_8	-.1074427220E-01	.74377058E-02	-1.445	.1507	1.4973627
SCORE_9	-.2075473458E-02	.81506135E-02	-.255	.7993	1.2325032
SCORE_10	.4157133506E-02	.59410538E-02	.700	.4852	.92980919
SCORE_11	.1969112574E-02	.15973240E-01	.123	.9021	.12442108
PROD_AFF	-.1005728085E-01	.24207003E-01	-.415	.6784	.58378378
CAPTIVE	.2746751628E-01	.48214080E-01	.570	.5697	.89729730
SMLIND	.1670441604E-01	.28135138E-01	.594	.5536	.29189189
C3	-.6429472410E-01	.38018073E-01	-1.691	.0929	.10810811
C4	-.6257546036E-01	.26904285E-01	-2.326	.0214	.25945946
C7	-.4387167290E-01	.51972888E-01	-.844	.3999	.48648649E-01
C8	-.4043444129E-01	.38841846E-01	-1.041	.2995	.12432432
C9	-.1604987218E-01	.91933512E-01	-.175	.8616	.16216216E-01
HRS_WORK	.1990176212E-02	.28686387E-02	.694	.4889	14.472973

Haryana – OLS bid level results – final specification (all variables)

```
+-----------------------------------------------------------------------+
| Ordinary    least squares regression    Weighting variable = none     |
| Dep. var. = LNWTPUB  Mean=   1.645156533    , S.D.=   .1365237226     |
| Model size: Observations =     188, Parameters =  21, Deg.Fr.=    167 |
| Residuals:  Sum of squares= 2.811394965     , Std.Dev.=         .12975 |
| Fit:        R-squared=  .193389, Adjusted R-squared =           .09679 |
| Model test: F[ 20,    167] =    2.00,    Prob value =           .00945 |
| Diagnostic: Log-L =    128.2991, Restricted(b=0) Log-L =      108.0972 |
|             LogAmemiyaPrCrt.=   -3.978, Akaike Info. Crt.=      -1.141 |
| Autocorrel: Durbin-Watson Statistic =   2.05019,   Rho =       -.02509 |
+-----------------------------------------------------------------------+
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.483922543     .95470017E-01    15.543   .0000
 PAYNOW     .4673689415E-01 .23105512E-01    2.023   .0447  3.7460193
 INVECSH    .1285497811E-01 .18170996E-01     .707   .4803  .38049597
 TOTAL_EP   .1766333316E-07 .11822386E-07    1.494   .1370  467329.78
 SL_KW_1  -.2873358693E-04 .11687334E-04   -2.459   .0150  500.20009
 SGENSH     .6189155673E-01 .60040030E-01    1.031   .3041  .40149589
 UN_CUT_S -.8481483721E-02 .92103538E-02    -.921   .3584  3.2021293
 UN_CUT_W  .5374276960E-02 .10872327E-01     .494   .6217  2.2436197
 S_CUT_S   .1768113191E-01 .17607312E-01    1.004   .3167  .26604734
 S_CUT_W  -.1565933290E-01 .25906533E-01    -.604   .5464  .18253777
 SCORE_2  -.4134101437E-02 .60139478E-02    -.687   .4928  1.0426223
 SCORE_3   .1418833421E-01 .79626954E-02    1.782   .0766  .49476649
 SCORE_5  -.5176826858E-02 .50563275E-02   -1.024   .3074  2.0745122
 SCORE_8  -.1118011298E-01 .46770598E-02   -2.390   .0179  1.5107032
 SCORE_10  .4799887304E-02 .53668989E-02     .894   .3724  .91497340
 CAPTIVE   .1443529351E-01 .41240181E-01     .350   .7268  .89893617
 C3       -.6453145537E-01 .34119418E-01   -1.891   .0603  .10638298
 C4       -.6382629830E-01 .24191568E-01   -2.638   .0091  .26595745
 C7       -.4593278444E-01 .48523335E-01    -.947   .3452  .47872340E-01
 C8       -.4518946721E-01 .33312728E-01   -1.357   .1768  .12234043
 HRS_WORK  .1029116229E-02 .17728456E-02     .580   .5624  14.486702
```

A 9.2 Econometric Analysis of factors influencing cost of captive generation

Variables used in analysis

Lncog1_n	:	Natural log of cost of captive generation from generator i
Lncapuf	:	Natural log of capacity factor (in percentage)
Lnucap1	:	Natural log of current (economic) cost of 1 kW of generator capacity
Lnfuel	:	Natural log of expenditure on fuel per kWh of power output of generator I
Lnmain	:	Natural log of operation and maintenance expenditure per kWh of power

Industry category : HT

State : Haryana

Descriptive Statistics of the variables used in analysis

Variable	Mean	Root Mean Square
LNCOG1_N	1.30	1.36
LNUCAP1	8.56	8.58
LNCAPUF	2.61	2.71
ln(ufuel)	.97	1.05
ln(umain)	-1.35	1.63

Correlations amongst the variables

No of cases = 479.

		LNCOG1_N	LNUCAP1	LNCAPUF	ln(ufuel)	ln(umain)
Std. Cross-product	LNCOG1_N	1.000	.959	.880	.984	-.698
	LNUCAP1	.959	1.000	.964	.927	-.821
	LNCAPUF	.880	.964	1.000	.869	-.868
	ln(ufuel)	.984	.927	.869	1.000	- 707
	ln(umain)	-.698	-.821	-.868	-.707	1.000
Sig. (1-tailed)	LNCOG1_N	.	.000	.000	000	000
	LNUCAP1	.000	.	.000	.000	.000
	LNCAPUF	.000	.000	.	.000	.000
	ln(ufuel)	.000	.000	.000	.	.000
	ln(umain)	.000	.000	.000	.000	

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.999	0.998	0.998	6.613E-02

Predictors: ln(umain), ln(ufuel), LNCAPUF, LNUCAP1
Dependent Variable: LNCOG1_N
Linear Regression through the Origin

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
LNUCAP1	.130	.002	.816	72.20	.000	.959	.957	.160	.039	25.942
LNCAPUF	-.162	.005	-.321	-33.01	.000	.880	-.835	-.073	.052	19.264
LN(UFUEL)	.749	.008	.578	93.894	.000	.984	.974	.208	.130	7.710
LN(UMAIN)	8.434E-02	.004	.101	22.200	.000	-.698	.714	.049	.238	4.209

a Dependent Variable: LNCOG1_N
b Linear Regression through the Origin

State : Karnataka

Descriptive Statistics

Variables	Mean	Root Mean Square
LNCOG1_N	1.51	1.57
LNUCAP1	8.85	8.87
LNCAPUF	2.61	2.86
LN(UFUEL)	1.09	1.13
LN(UMAIN)	-1.89	2.17

Correlations amongst the variables

No of cases = 271.

		LNCOG1_N	LNUCAP1	LNCAPUF	ln(ufuel)	ln(umain)
Std. Cross-product	LNCOG1_N	1.000	.960	.788	.977	-.767
	LNUCAP1	.960	1.000	.918	.965	-.873
	LNCAPUF	.788	.918	1.000	.853	-.908
	LN(UFUEL)	.977	.965	.853	1.000	-.824
	LN(UMAIN)	-.767	-.873	-.908	-.824	1.000
Sig. (1-tailed)	LNCOG1_N	.	.000	.000	.000	.000
	LNUCAP1	.000	.	.000	.000	.000
	LNCAPUF	.000	.000	.	.000	.000
	LN(UFUEL)	.000	.000	.000	.	.000
	LN(UMAIN)	.000	.000	.000	.000	.

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.997	.994	.994	.1218

Predictors: ln(umain), ln(ufuel), LNCAPUF, LNUCAP1
Dependent Variable: LNCOG1_N

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
LNUCAP1	.164	.004	.929	37.364	.000	.960	.916	.176	.036	27.744
LNCAPUF	-.247	.008	-.450	-30.126	.000	.788	-.879	-.142	.100	10.014
ln(ufuel)	.714	.026	.513	27.249	.000	.977	.858	.129	.063	15.942
ln(umain)	4.212E-02	.008	.058	5.009	.000	-.767	.293	.024	.165	6.065

a Dependent Variable: LNCOG1_N
b Linear Regression through the Origin

Industry category : LT

State : Haryana

Descriptive Statistics of the variables used in analysis

Variable	Mean	Root Mean Square
LNCOG1_N	1.39	1.42
LNUCAP1	8.49	8.51
LNCAPUF	2.15	2.25
ln(ufuel)	.92	.97
ln(umain)	-.94	1.18

Correlations amongst the variables

No of cases = 196.

		LNCOG1_N	LNUCAP1	LNCAPUF	ln(ufuel)	ln(umain)
Std. Cross-product	LNCOG1_N	1.000	.978	.900	.974	-.696
	LNUCAP1	.978	1.000	.959	.949	-.782
	LNCAPUF	.900	.959	1.000	.908	-.831
	ln(ufuel)	.974	.949	.908	1.000	-.729
	ln(umain)	-.696	-.782	-.831	-.729	1.000
Sig. (1-tailed)	LNCOG1_N	.	.000	.000	.000	.000
	LNUCAP1	.000	.	.000	.000	.000
	LNCAPUF	.000	.000	.	.000	.000
	ln(ufuel)	.000	.000	.000	.	.000
	ln(umain)	.000	.000	.000	.000	.

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.998	0.997	0.997	8.25E-02
0.998	0.997	0.997	8.25E-02

Predictors: ln(umain), ln(ufuel), LNCAPUF, LNUCAP1
Dependent Variable: LNCOG1_N

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
LNUCAP1	.165	.003	.987	50.553	.000	.978	.964	.210	.045	22.169
LNCAPUF	-.238	.010	-.376	-22.722	.000	.900	-.854	-.094	.063	15.929
ln(ufuel)	.646	.019	.440	33.524	.000	.974	.924	.139	.100	10.045
ln(umain)	.101	.009	.084	11.215	.000	-.696	.629	.046	.305	3.278

State : Karnataka

Descriptive Statistics of the variables used in analysis

	Mean	Root Mean Square
LNCOG1_N	1.67	1.73
LNUCAP1	8.75	8.76
LNCAPUF	1.96	2.10
ln(ufuel)	1.09	1.14
ln(umain)	-1.44	1.67

Correlation amongst the variables

No of cases = 147

		LNCOG1_N	LNUCAP1	LNCAPUF	ln(ufuel)	ln(umain)
Std. Cross-product	LNCOG1_N	1.000	.971	.829	.971	-.759
	LNUCAP1	.971	1.000	.930	.957	-.855
	LNCAPUF	.829	.930	1.000	.867	-.900
	ln(ufuel)	.971	.957	.867	1.000	-.796
	ln(umain)	-.759	-.855	-.900	-.796	1.000
Sig. (1-tailed)	LNCOG1_N	.	.000	.000	.000	.000
	LNUCAP1	.000	.	.000	.000	.000
	LNCAPUF	.000	.000	.	.000	.000
	ln(ufuel)	.000	.000	.000	.	.000
	ln(umain)	.000	.000	.000	.000	.

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.997	.995	.995	.1266

Predictors: ln(umain), ln(ufuel), LNCAPUF, LNUCAP1
Dependent Variable: LNCOG1_N

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
LNUCAP1	.218	.006	1.101	37.861	.000	.971	.954	.228	.043	23.250
LNCAPUF	-.357	.016	-.434	-21.759	.000	.829	-.876	-.131	.091	10.932
ln(ufuel)	.527	.033	.347	16.227	.000	.971	.805	.098	.080	12.539
ln(umain)	7.045E-02	.014	.068	4.876	.000	-.759	.378	.029	.187	5.355